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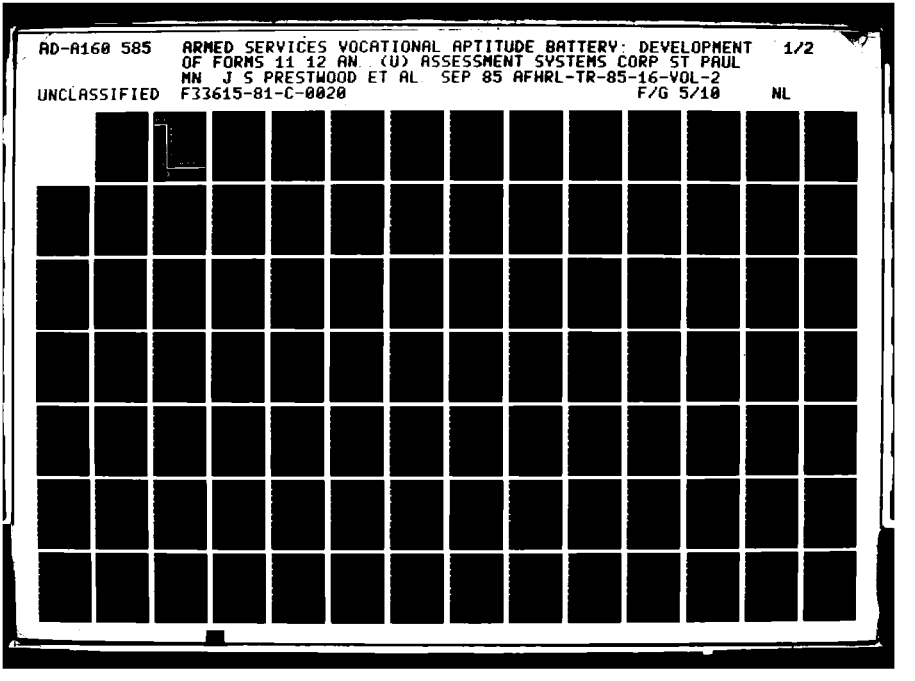

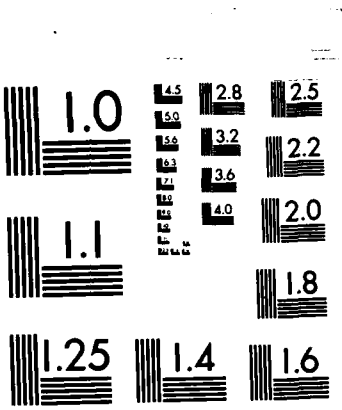

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AIR FORCE HUMAN RESOURCES LABORATORY

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ARMED SERVICES VOCATIONAL APTITUDE BATTERY: DEVELOPMENT OF FORMS 11, 12, AND 13

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Final Report for Period October 1981 - May 1985

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The Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nationals.

This report has been reviewed and is approved for publication.

NANCY GUINN, Technical Director
Manpower and Personnel Division

DENNIS W. JARVI, Colonel, USAF
Commander

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19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

This report describes the development of the Armed Services Vocational Aptitude Battery (ASVAB) Forms 11, 12, and 13. The items for the new forms were supplied by the Air Force Human Resources Laboratory (AFHRL). They were administered to examinees in Recruit Training Centers (RTCs) along with items in the ASVAB 8b, a test battery parallel to the reference test used in this study, ASVAB 8a, as part of a previous research effort. Using the pretest data, eight new power subtests were constructed by matching classical item statistics for the new items to corresponding ASVAB 8b items. Comparisons of classical and item response theory (IRT) item statistics suggested that the newly developed subtests should be parallel among themselves and to ASVAB 8b.

Complete new ASVAB test batteries and ASVAB 8a were administered to examinees in RTCs using an equivalent-groups design. In addition, partial batteries of ASVAB Form 11a (judged to be the most "central" of the new forms) and ASVAB 8a were administered to examinees at Military Entrance Processing Stations (MEPS). The demographic statistics for the RTC and MEPS samples indicated that the assumptions of the equivalent-

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groups design were met. Summary score statistics were computed for each subtest administered in order to determine if like-named subtests were parallel. Classical item statistics and IRT parameters showed that the new subtests were more parallel among themselves than they were to the like-named ASVAB 8a subtests.

Linear and equipercentile equating tables were developed for the raw subtest scores using a 1980 weighted probability sample of American youth (males and females, ages 18-23) as the normative base. Two raw-score composites, Armed Forces Qualification Test (AFQT) and Verbal (VE), and 14 standard-score composites were also equated. Equating tables were developed for each of the six new forms administered in the RTCs and for the single form administered in the MEPS. Average linear and equipercentile tables were also developed from the RTC tables. Several statistics were used to compare the tables. These were the average bias, average absolute difference (AAD), and root mean square difference (RMSD) between table entries. Bias, AAD, and RMSD statistics weighted by the number of examinees corresponding to each entry in the table were also computed. Two linear tables were selected for operational use. For one form (ASVAB 12a), the table developed in the RTCs for that form was selected; and for the remaining five forms, the linear table developed in the MEPS (using ASVAB 11a) was selected.

Prior to October 1984, the ASVAB composites had a score scale referenced to the population of men serving during World War II (WWII). The WWII score scale was used continuously from about 1950 through 1 October 1984, when ASVAB Forms 8, 9, and 10 were replaced with ASVAB Forms 11, 12, and 13. With the implementation of ASVAB Forms 11, 12, and 13, the normative base for the ASVAB score scale was changed from the WWII mobilization population of men to the 1980 weighted probability sample of American youth. Equating of the new ASVAB forms simultaneously accomplished two basic goals. First, the scores on the new test forms were made comparable; and second, the scores were scaled in relation to the wide range of abilities characteristic of the current mobilization population.

SUMMARY

Six new forms of the Armed Services Vocational Aptitude Battery (ASVAB) were developed. The ASVAB is used in making personnel selection and classification decisions by the United States Armed Services. It is routinely updated to enhance security, to replace items that have become obsolete, and to take advantage of advances in the field of psychological measurement. The six new forms of the test were equated to a standard reference test, ASVAB 8a, using normative data based on a 1980 weighted probability sample of American youth, ages 18-23. Equating allows the services to report the distributions of examinee ability on a common metric or standard regardless of which form of the test the examinees take. It also provides consistent meanings for cutting scores used in selection and classification.

The new forms of the ASVAB were analyzed using data collected in Recruit Training Centers (RTCs) and Military Entrance Processing Stations (MEPS). The subtests and items were analyzed using both conventional and item response theory procedures. For each form, linear and smoothed equipercentile equating tables were then developed for the 10 raw subtest scores, two raw-score composites, and 14 standard-score composites. The Joint Services Selection and Classification Working Group met in April of 1983 and selected two sets of linear equating tables for future use. For ASVAB 12a, the tables developed in the RTCs for that form were selected. For the other new forms, the tables developed in the MEPS using ASVAB 11a were selected.

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ARMED SERVICES VOCATIONAL APTITUDE BATTERY: DEVELOPMENT OF ASVABS 11, 12, AND 13

VOLUME II

This volume of the report is divided into two parts. Part A contains plots comparing the linear, unsmoothed equipercentile, and smoothed equipercentile equating transformations for each subtest and for the two raw-score composites (VE and AFQT). The comparisons are shown separately for the equating tables developed for the individual forms administered in the Recruit Training Centers (RTCs), for the average RTC table, and for the table developed in the Military Entrance Processing Stations (MEPS).

Part B contains plots comparing the linear and smoothed equipercentile equating transformations based on the tables developed in the MEPS with those from the same form administered in the RTCs (RTC 158--ASVAB 11a), those from the average RTC table, and those from the most deviant individual form administered in the RTCs (RTC 370--ASVAB 12a). The plots are shown separately for each subtest and for the two raw-score composites.

PART A

PLOTS OF LINEAR, UNSMOOTHED EQUIPERCENTILE, AND SMOOTHED EQUIPERCENTILE EQUATING TRANSFORMATIONS

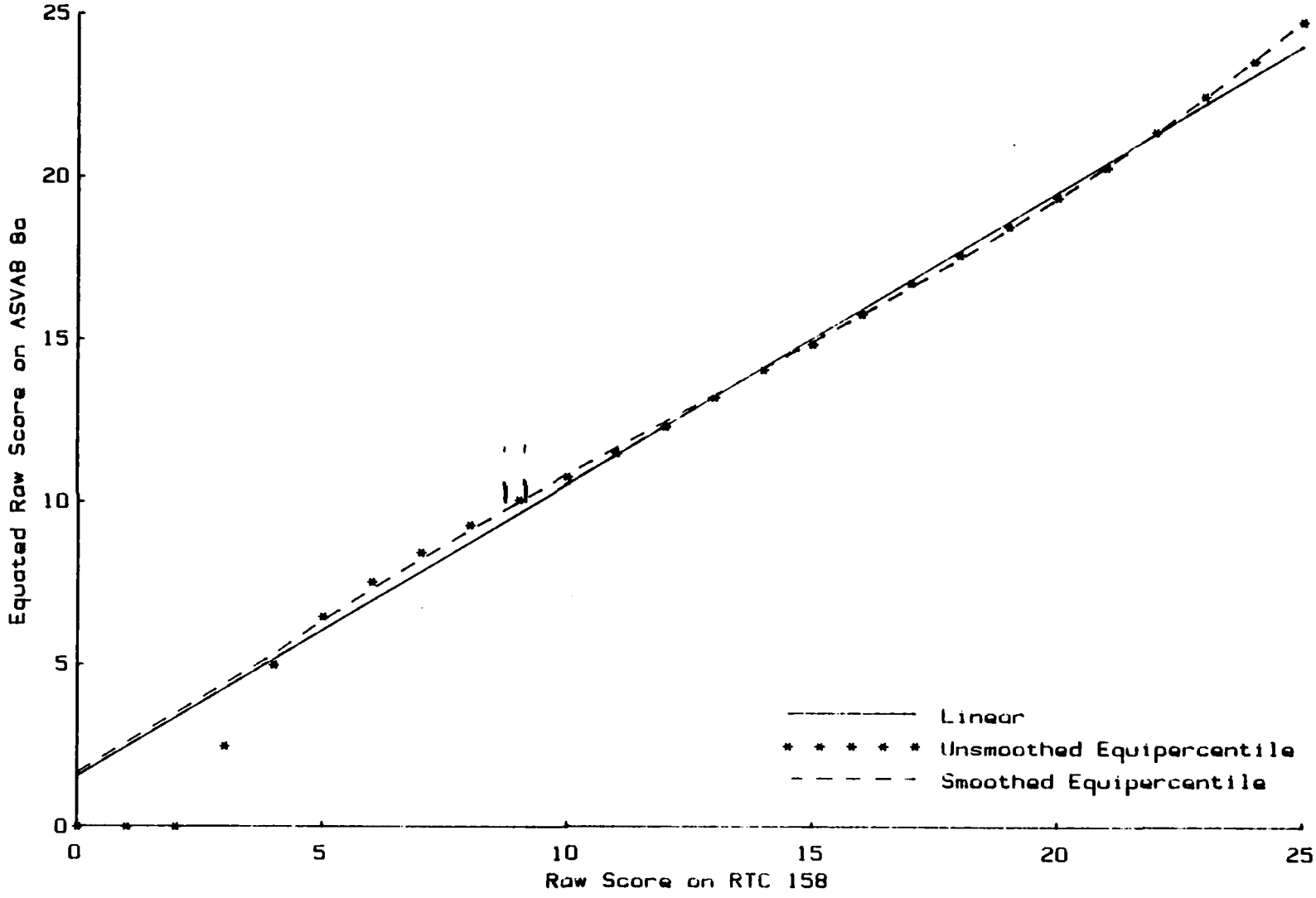


Figure A-1. Equating Transformations for Raw General Science Scores from RTC 158 (ASVAB 11a).

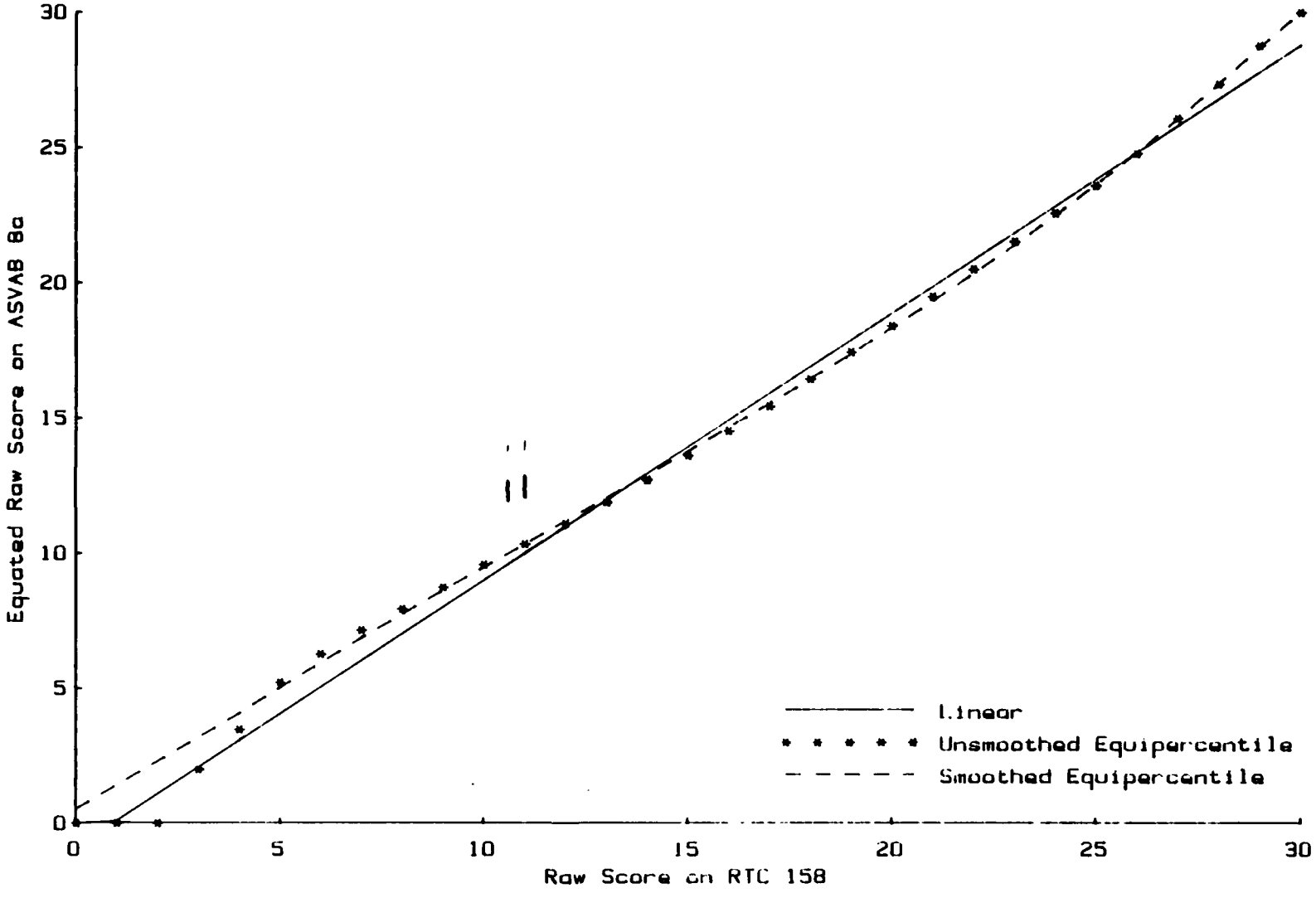


Figure A-2. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 158 (ASVAB 11a).

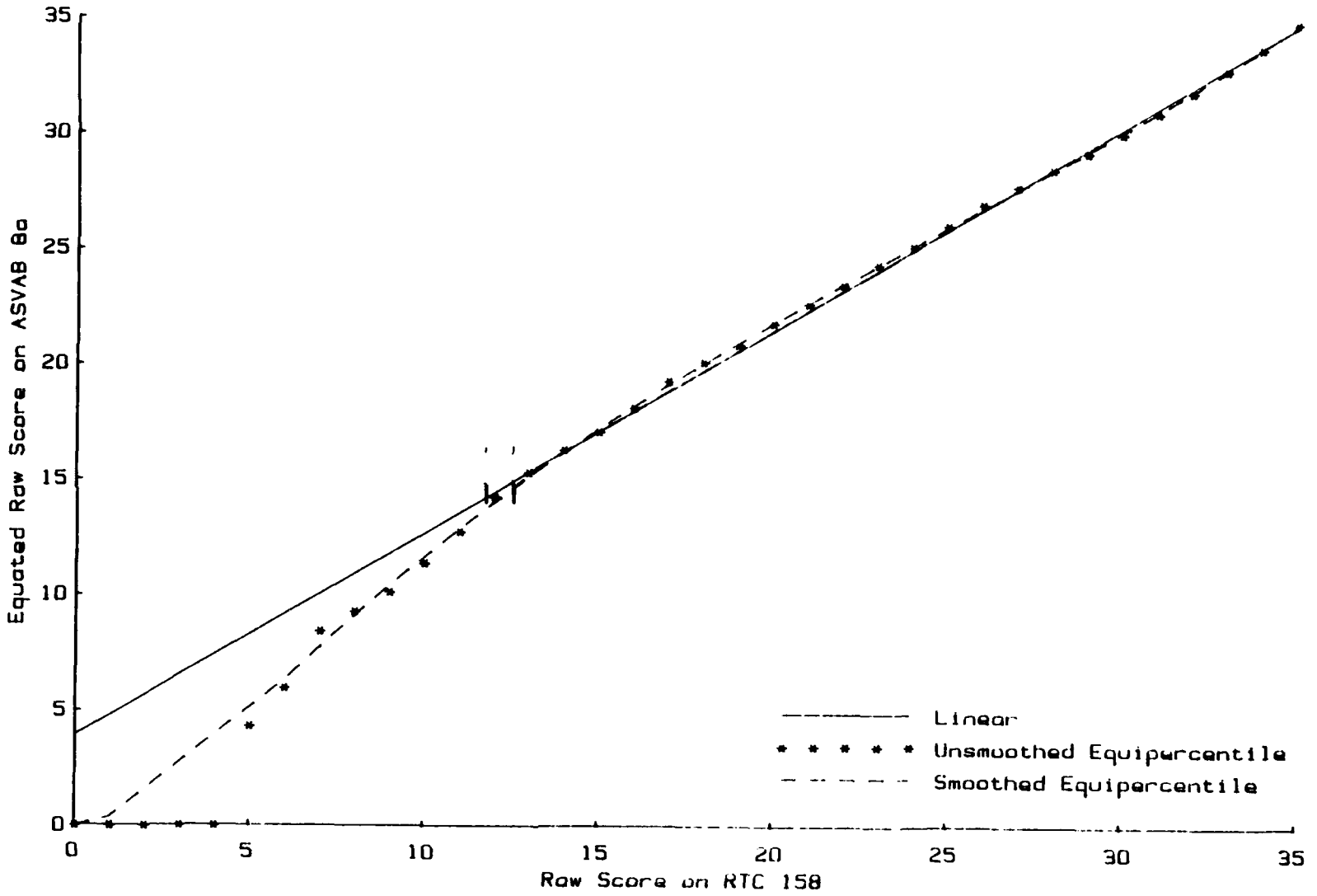


Figure A-3. Equating Transformations for Raw Word Knowledge Scores from RTC 158 (ASVAB 11a).

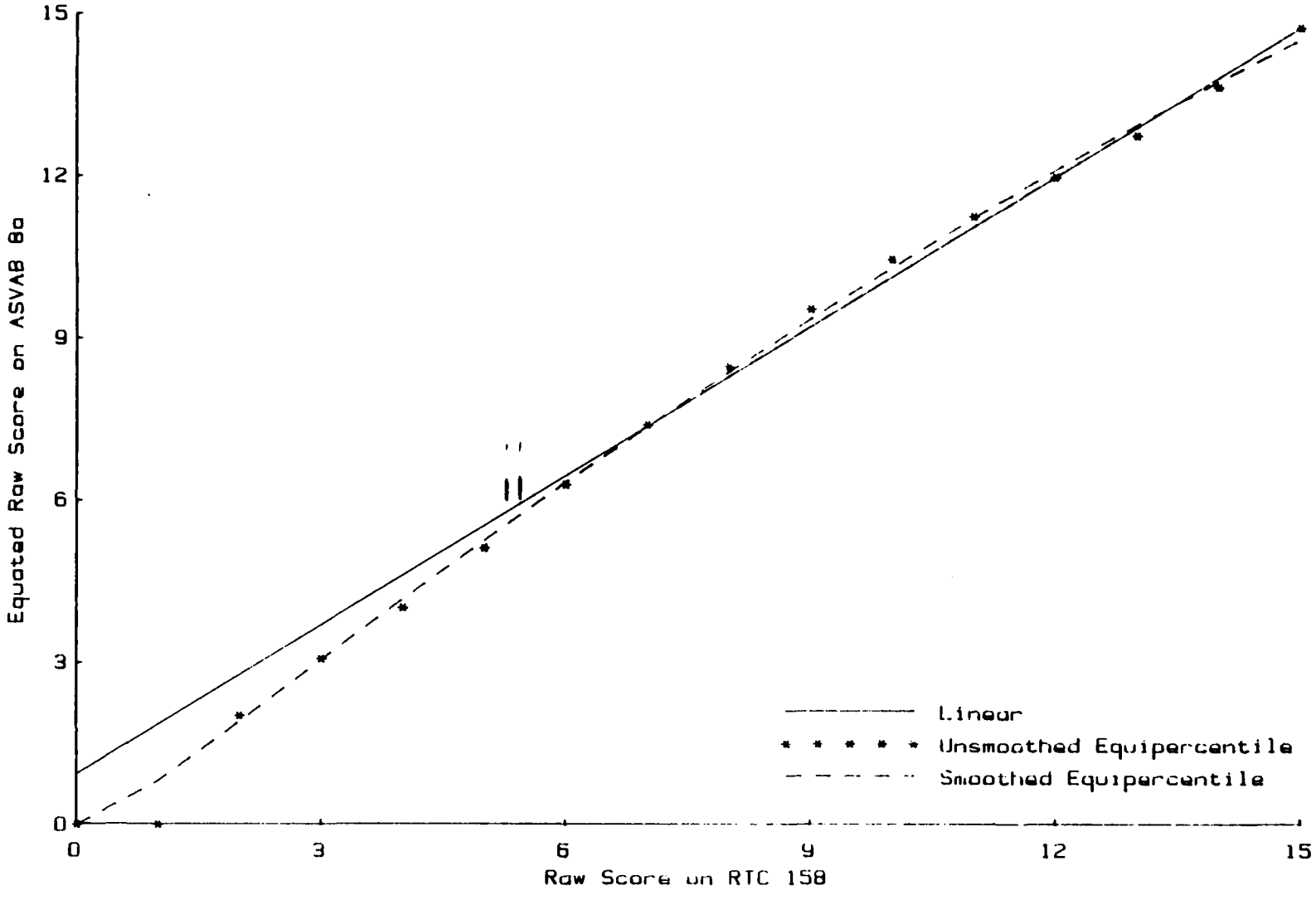


Figure A-4. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 158 (ASVAB 11a).

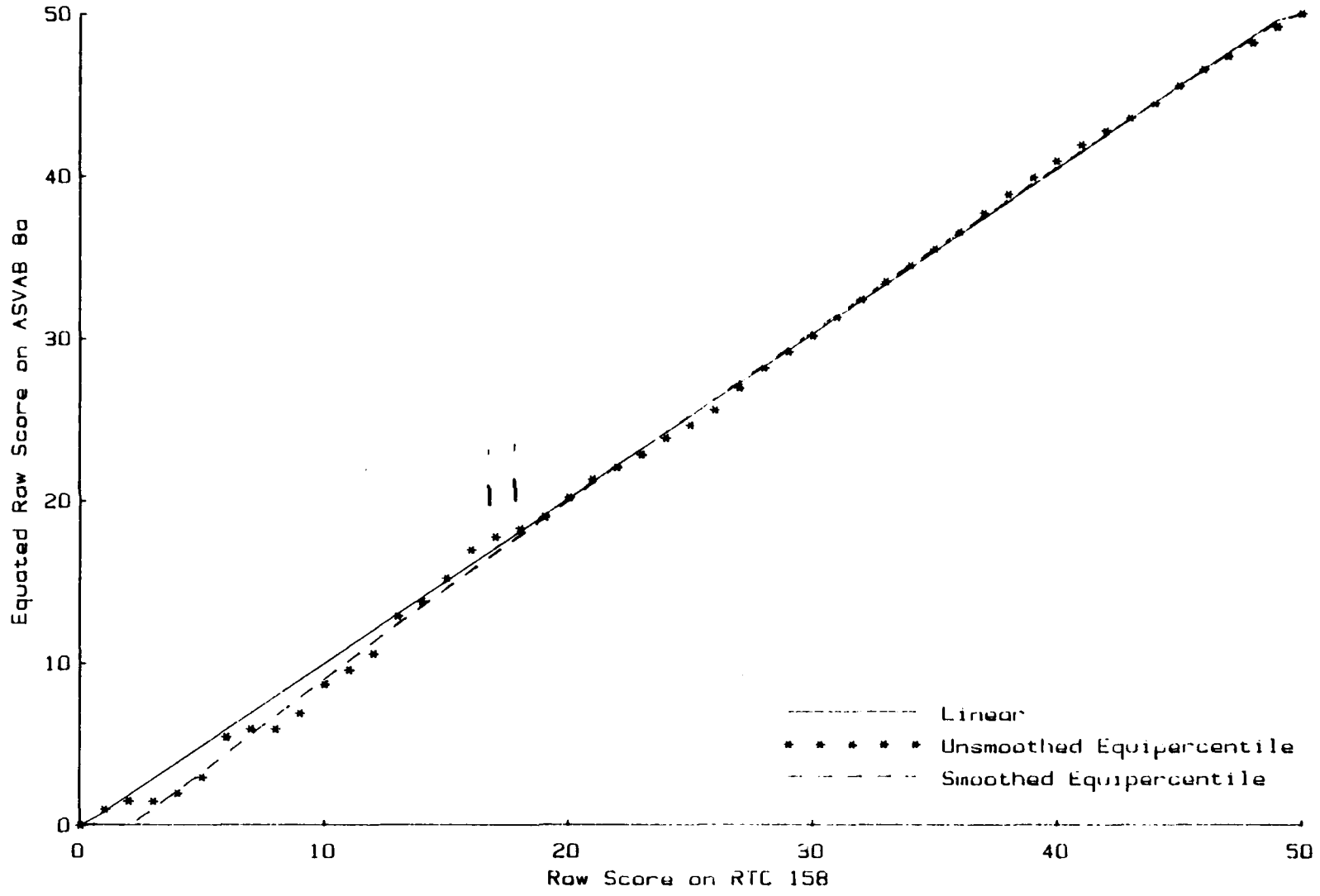


Figure A-5. Equating Transformations for Raw Numerical Operations Scores from RTC 158 (ASVAB 11a).

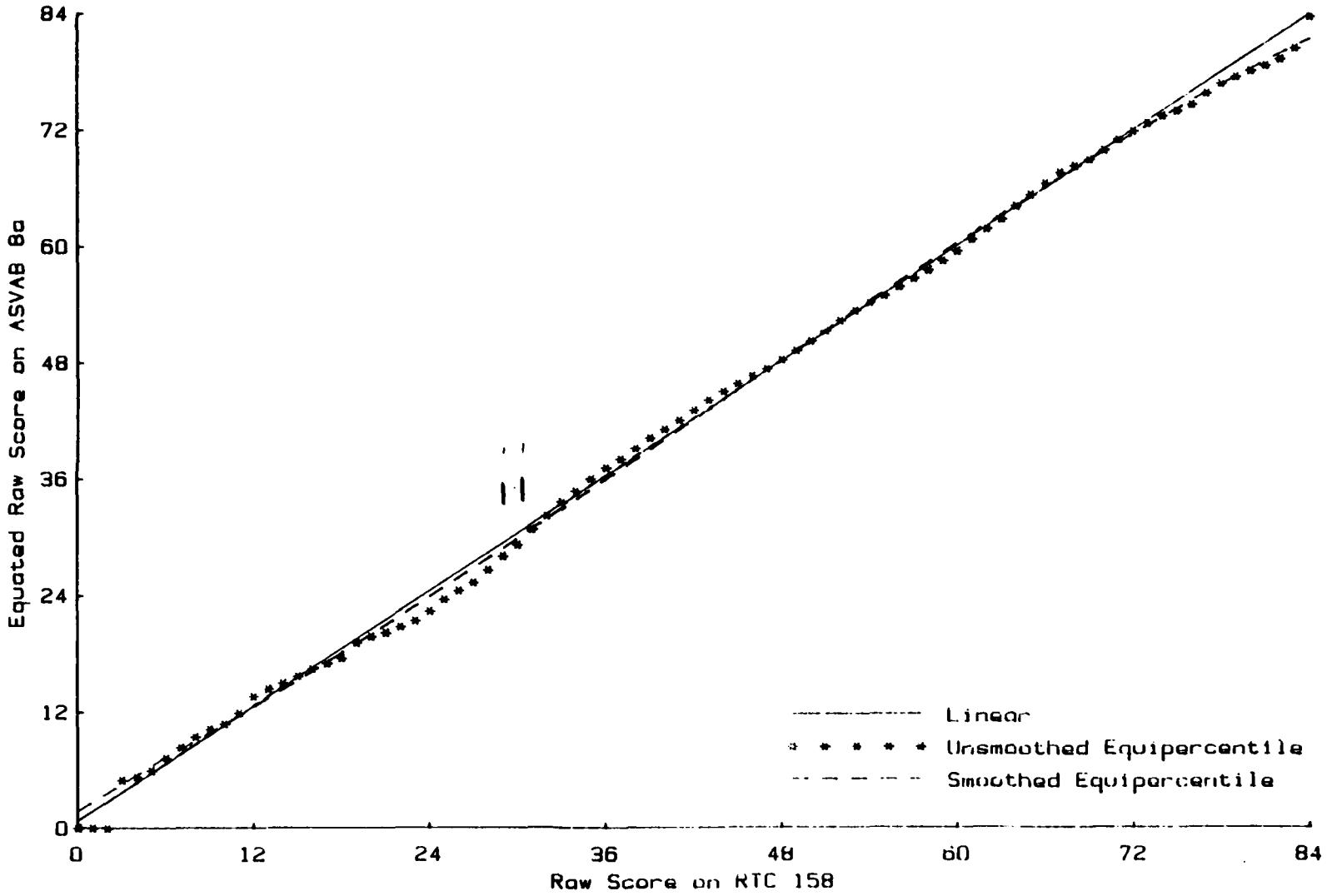


Figure A-6. Equating Transformations for Raw Coding Speed Scores from RTC 158 (ASVAB 11a).

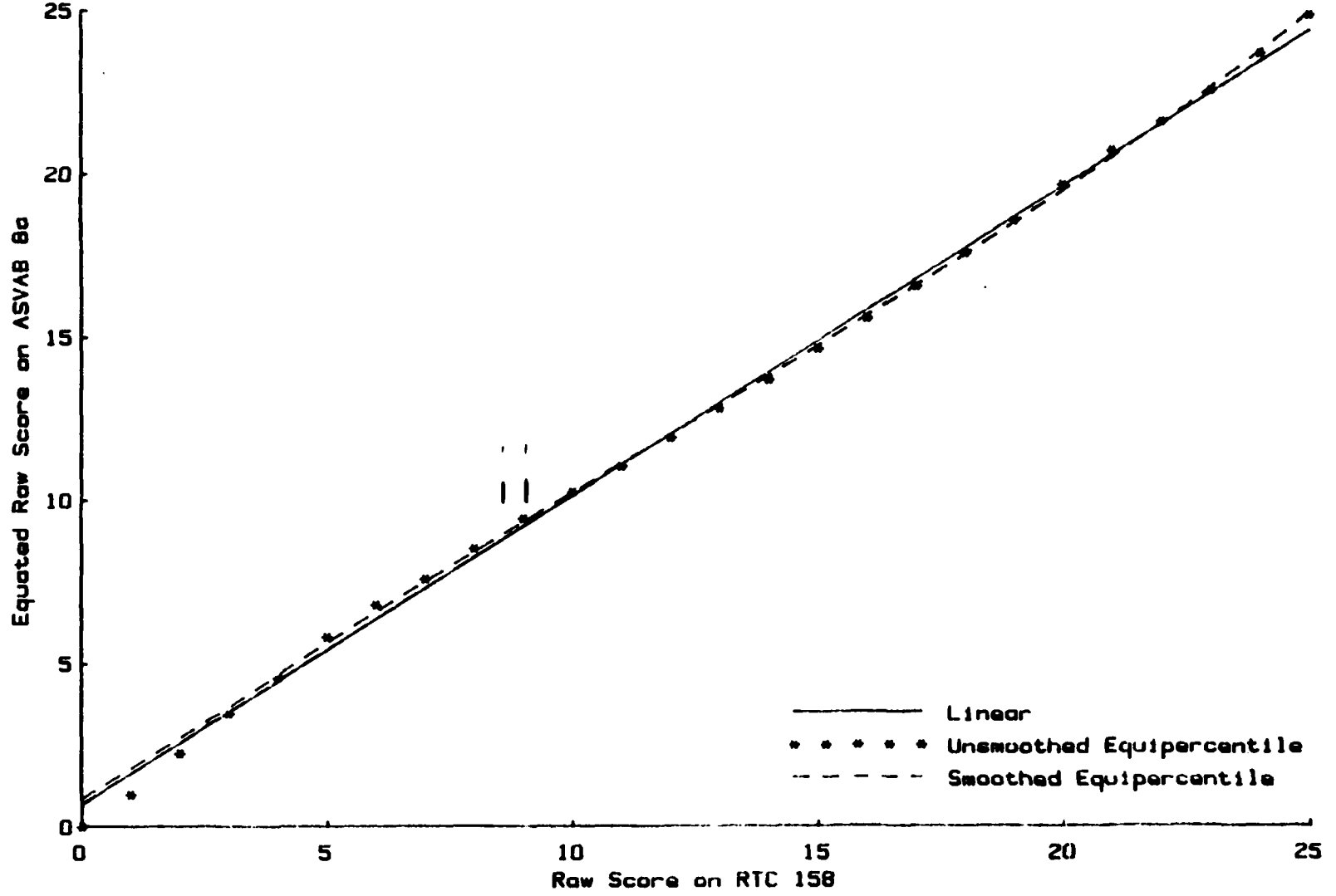


Figure A-7. Equating Transformations for Raw Auto & Shop Information Scores from RTC 158 (ASVAB 11a).

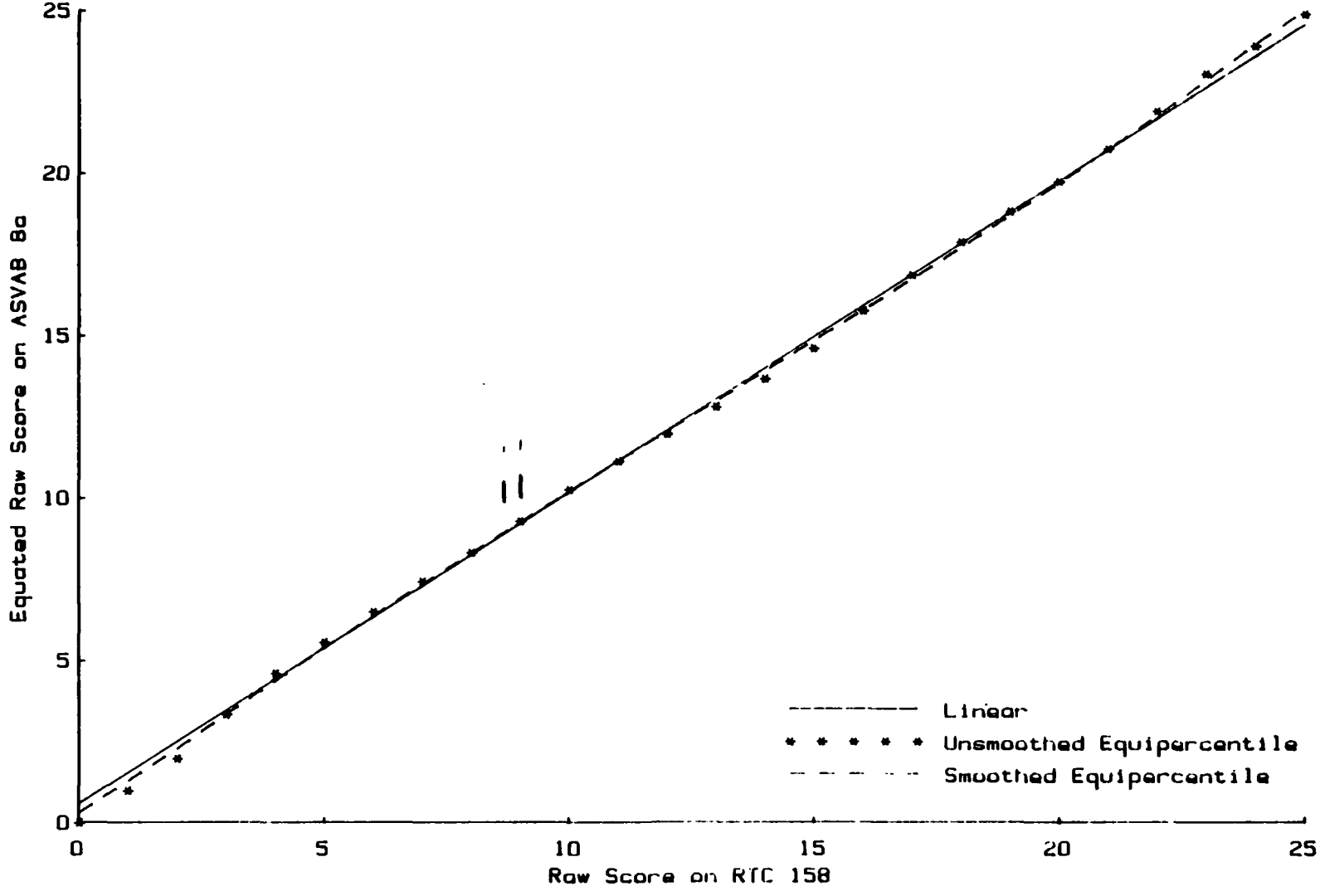


Figure A-8. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 158 (ASVAB 11a).

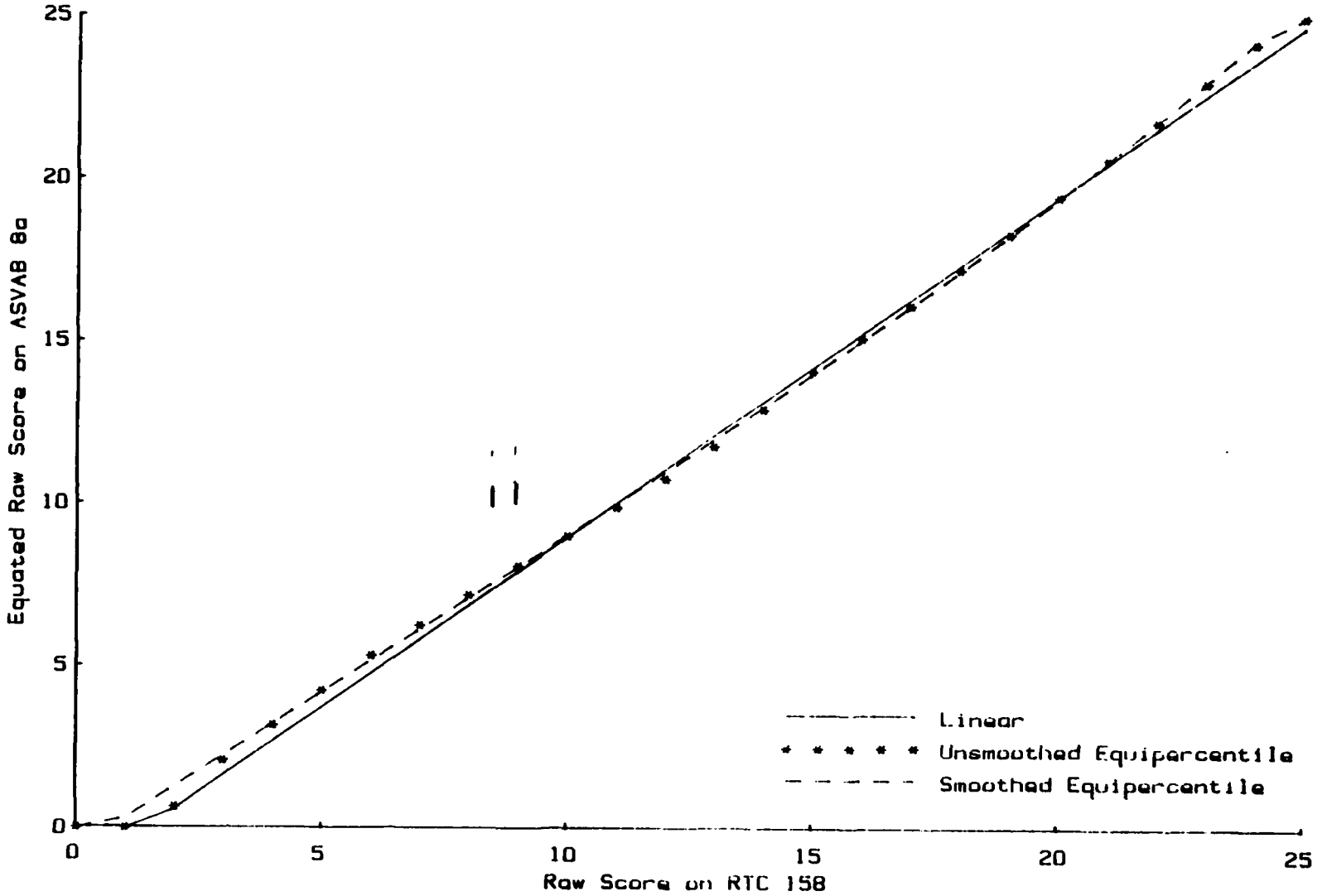


Figure A-9. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 158 (ASVAB 11a).

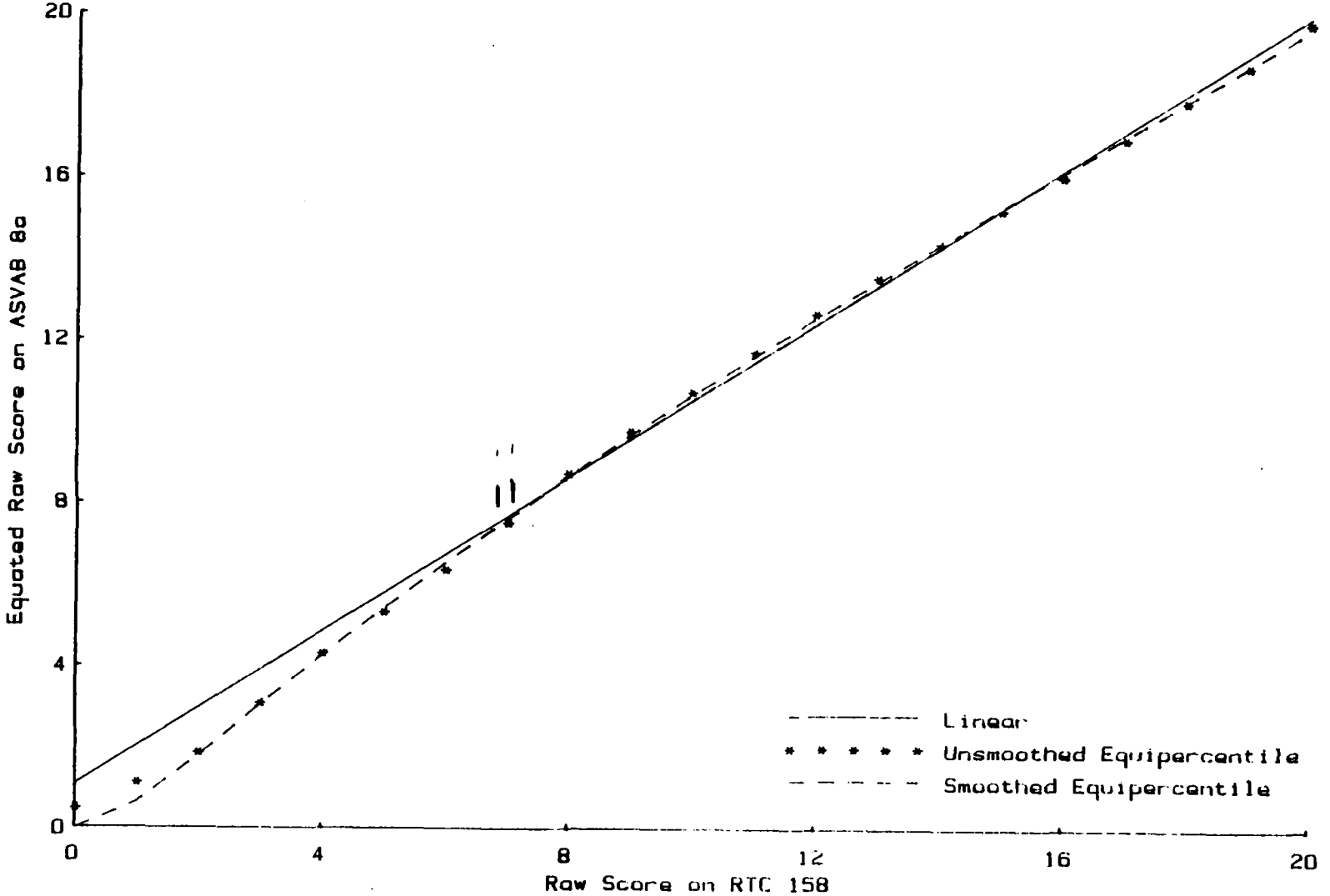


Figure A-10. Equating Transformations for Raw Electronics Information Scores from RTC 158 (ASVAB 11a).

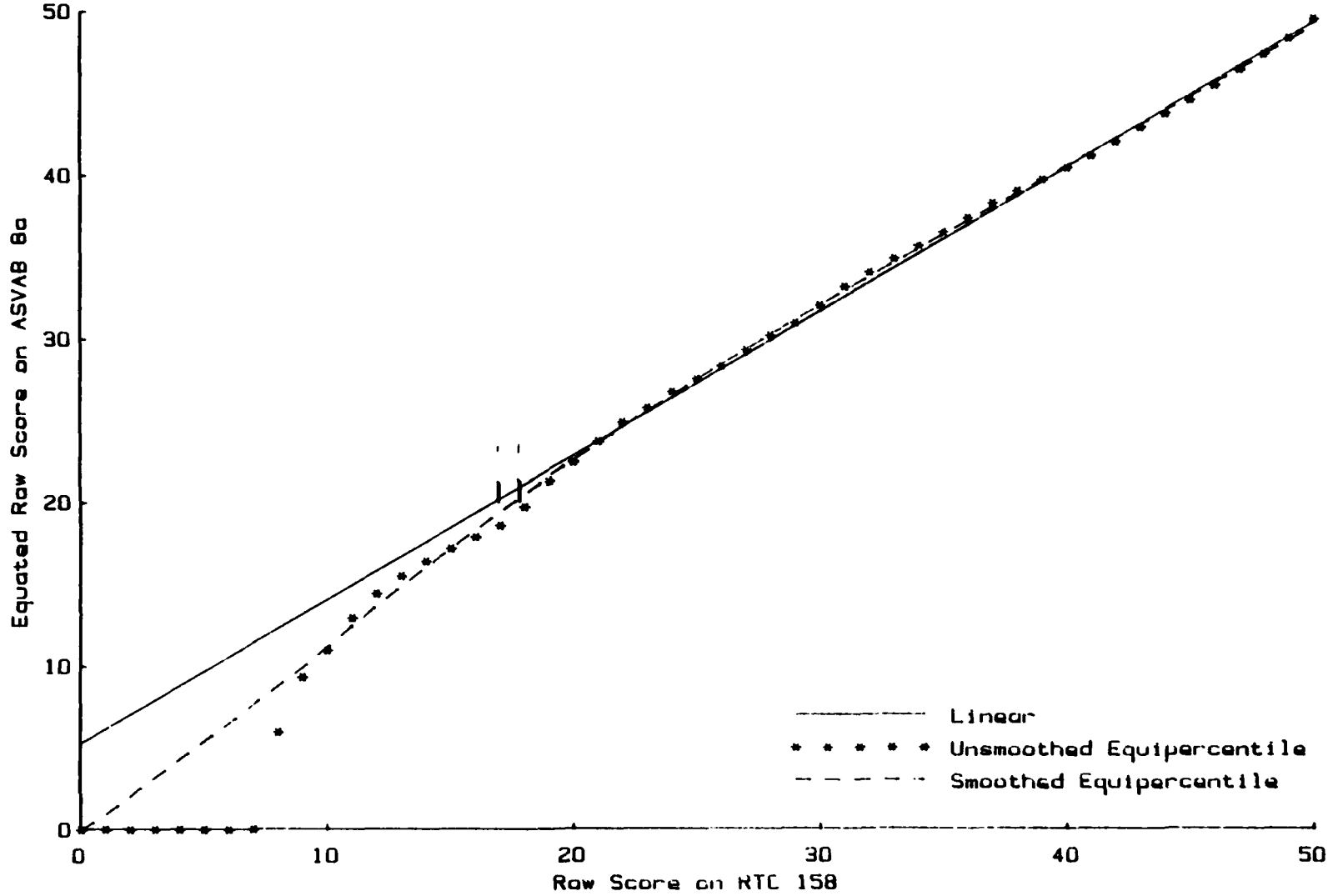


Figure A-11. Equating Transformations for Raw Verbal Composite Scores from RTC 158 (ASVAB 11a).

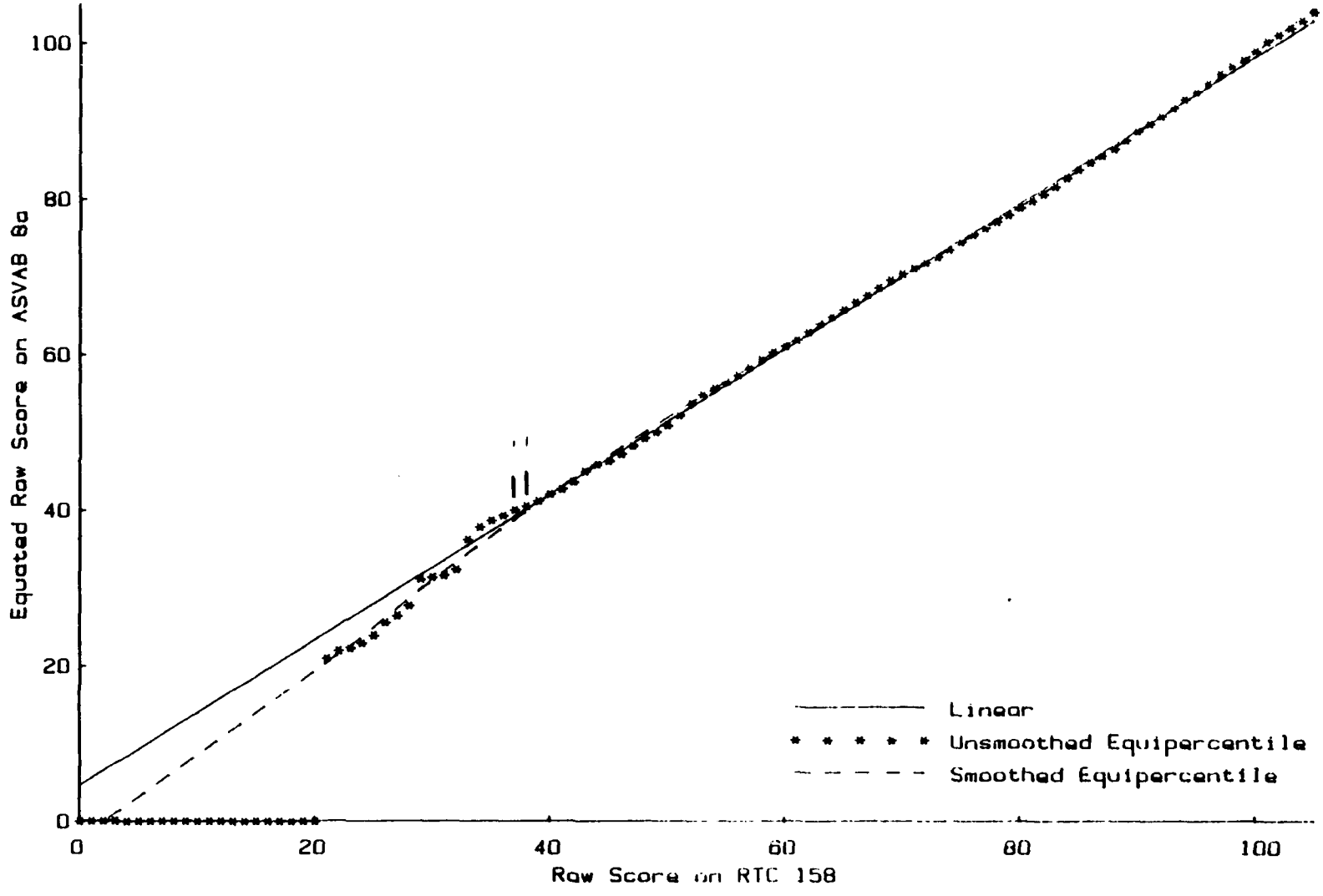


Figure A-12. Equating Transformations for Raw AFQT Composite Scores from RTC 158 (ASVAB 11a).

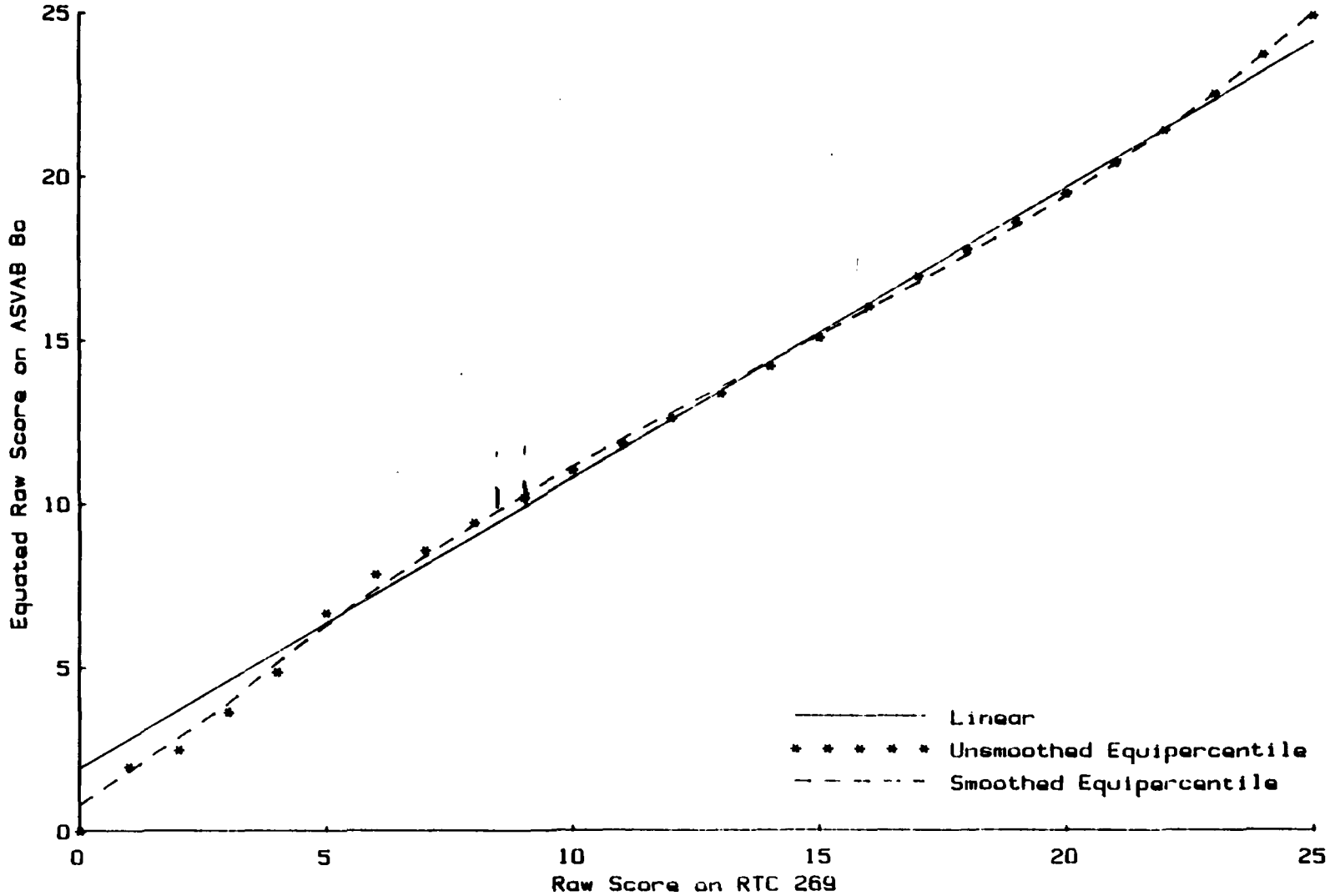


Figure A-13. Equating Transformations for Raw General Science Scores from RTC 269 (ASVAB 11b).

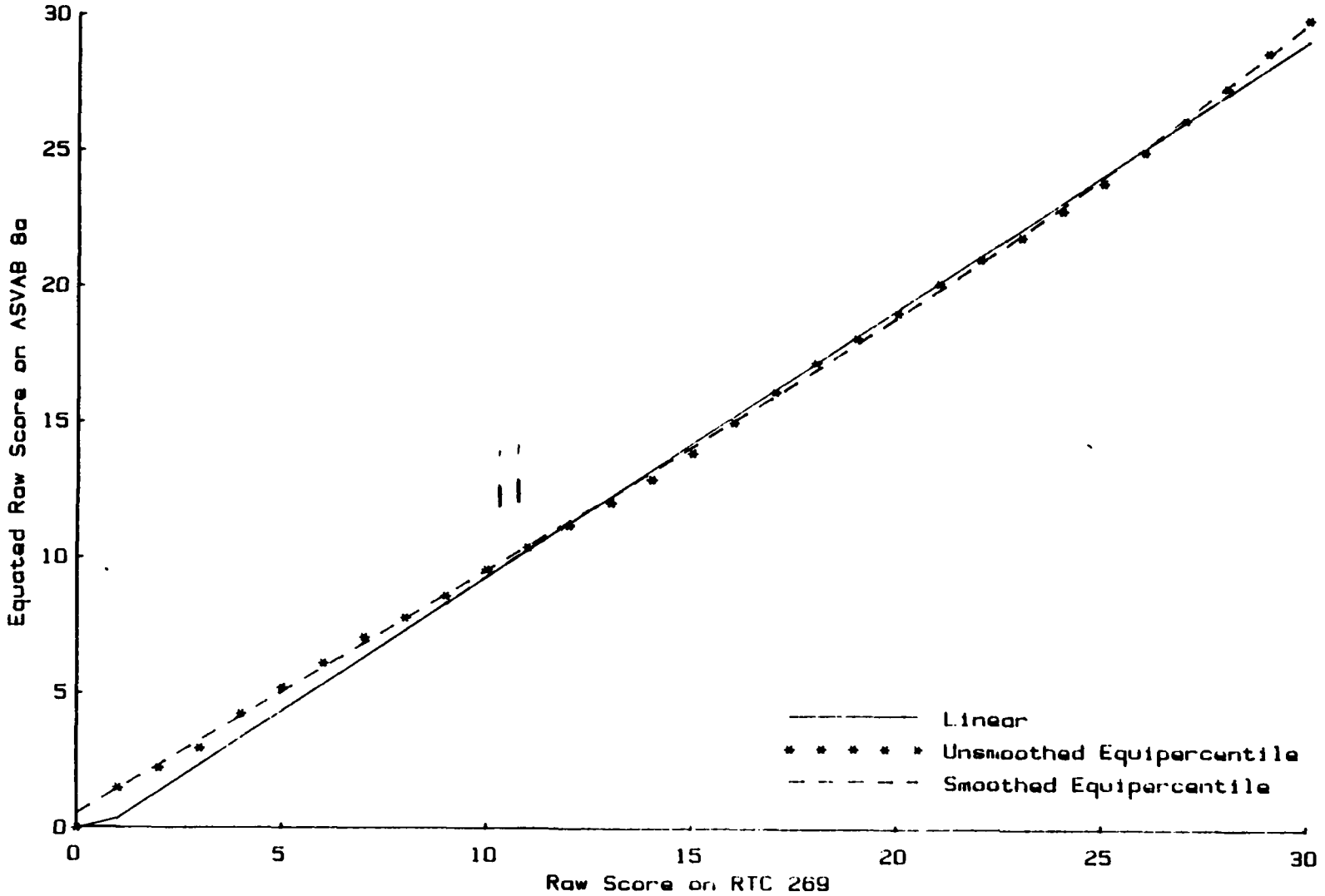


Figure A-14. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 269 (ASVAB 11b).

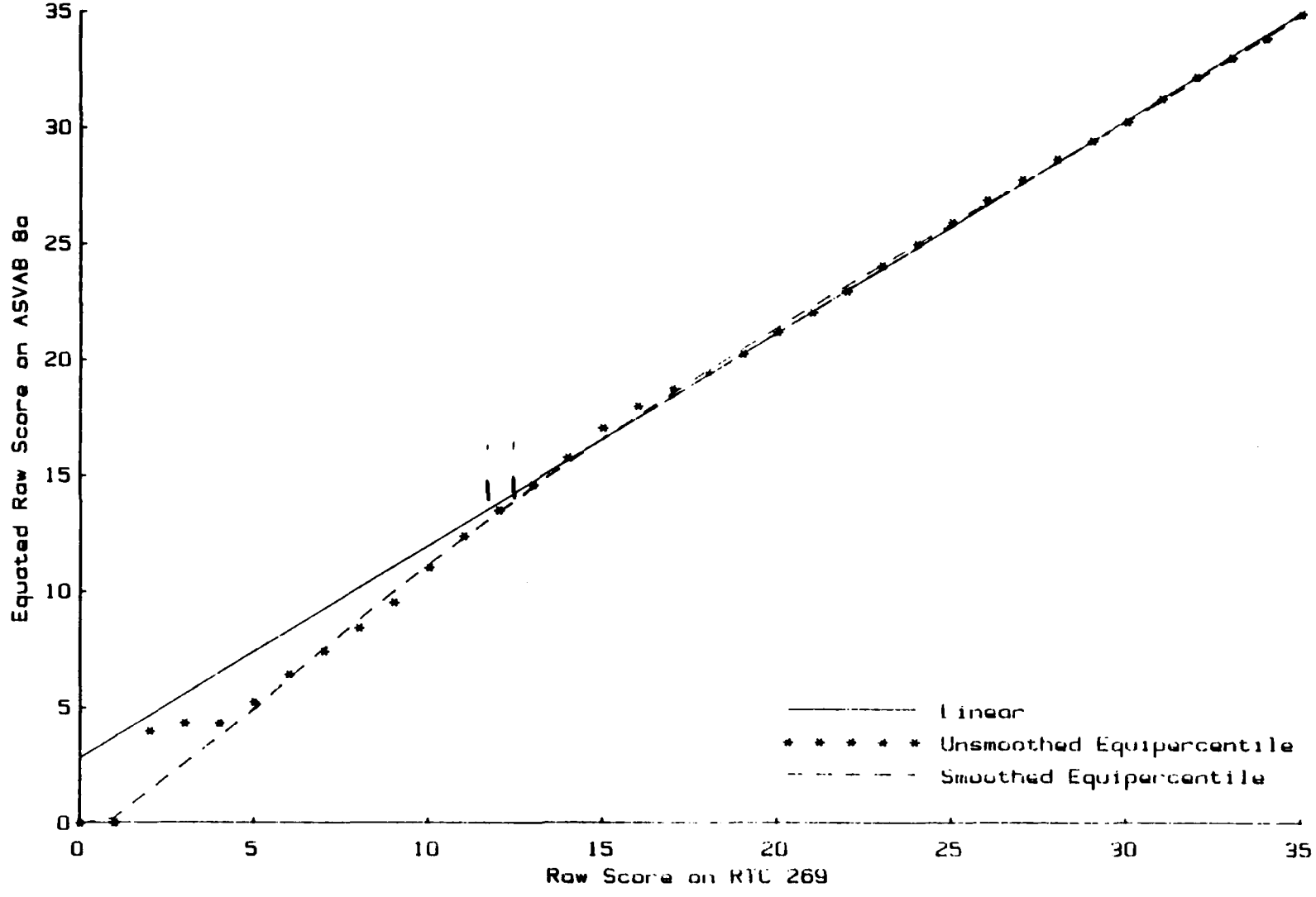


Figure A-15. Equating Transformations for Raw Word Knowledge Scores from RTC 269 (ASVAB 11b).

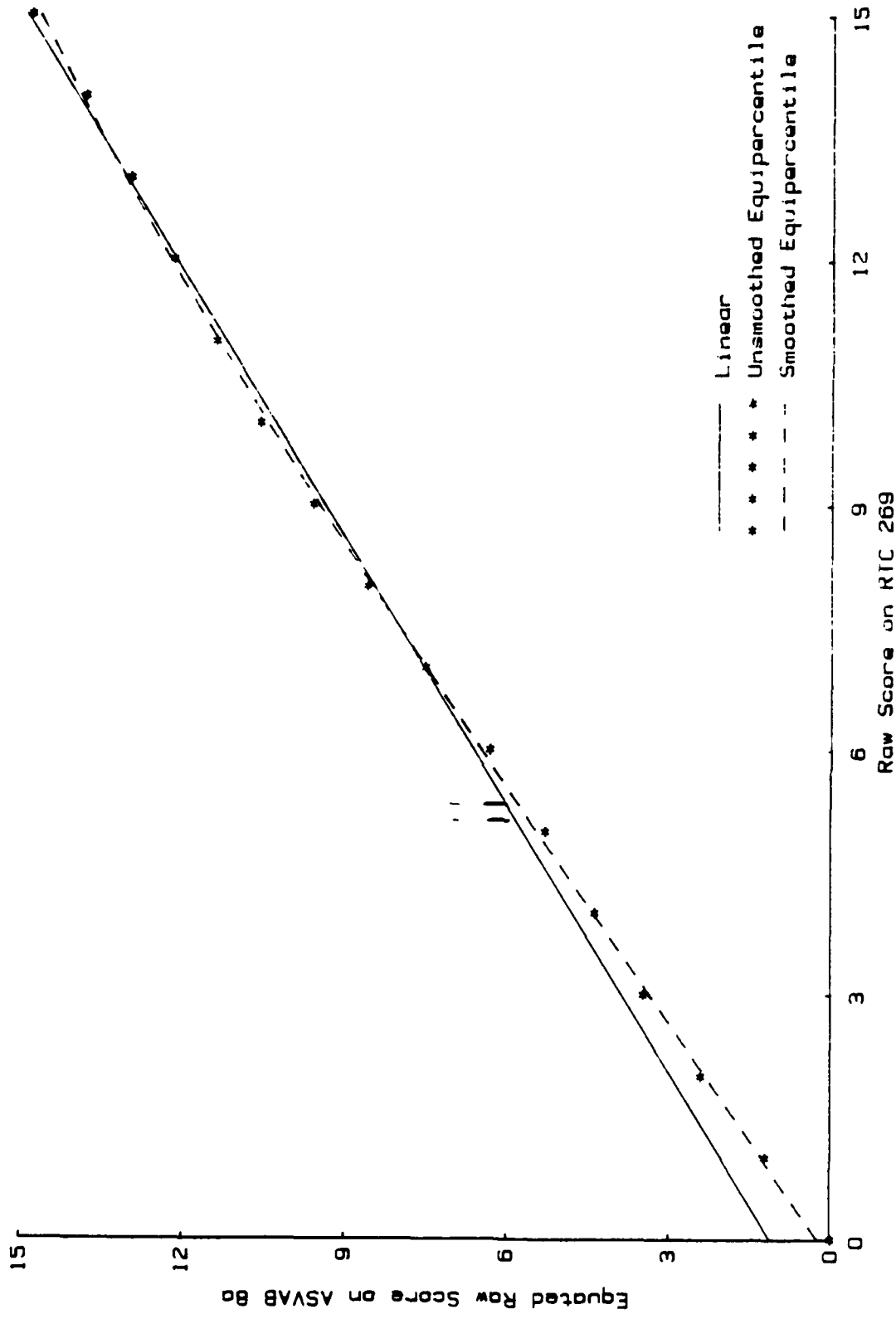


Figure A-16. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 269 (ASVAB 11b).

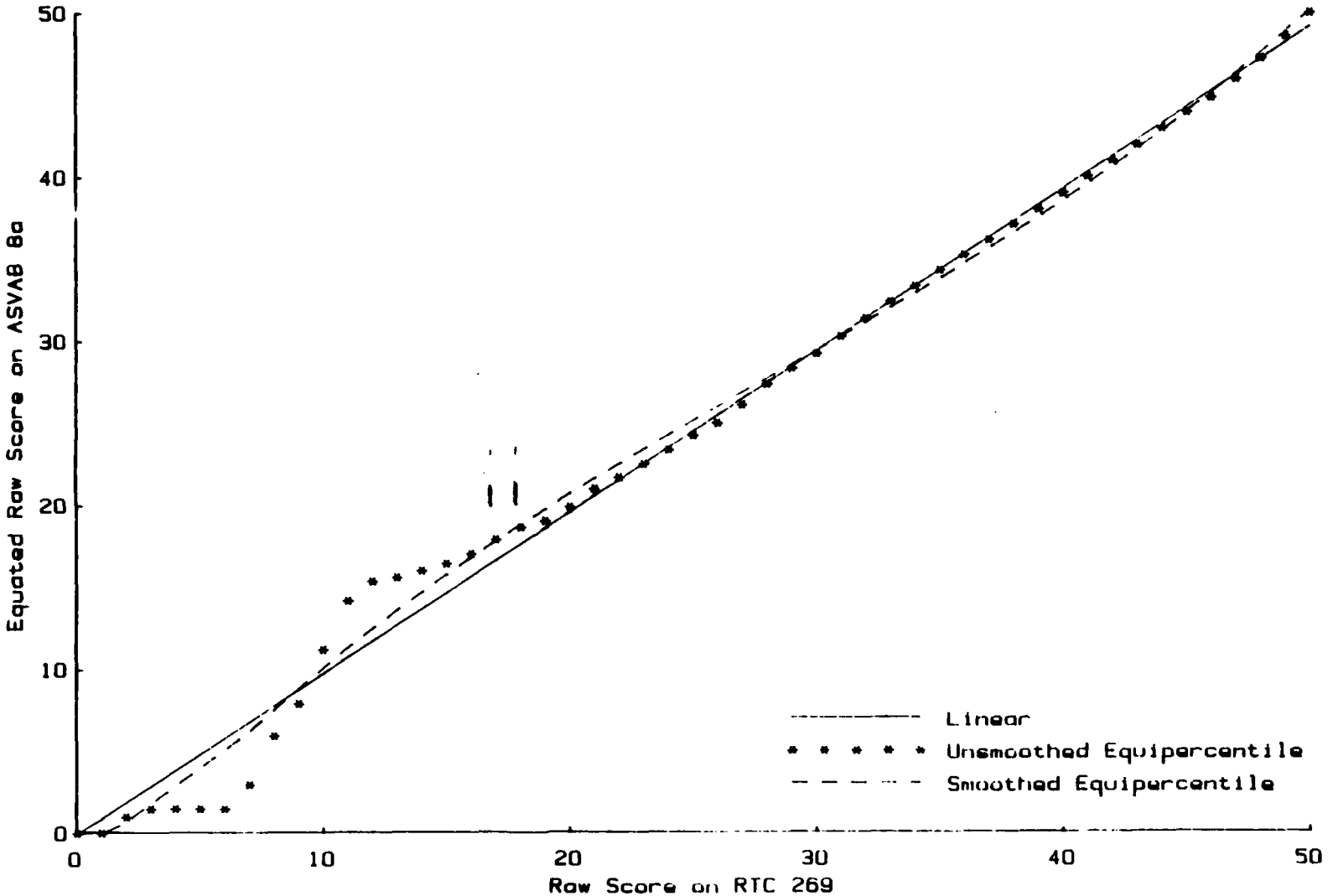


Figure A-17. Equating Transformations for Raw Numerical Operations Scores from RTC 269 (ASVAB 11b).

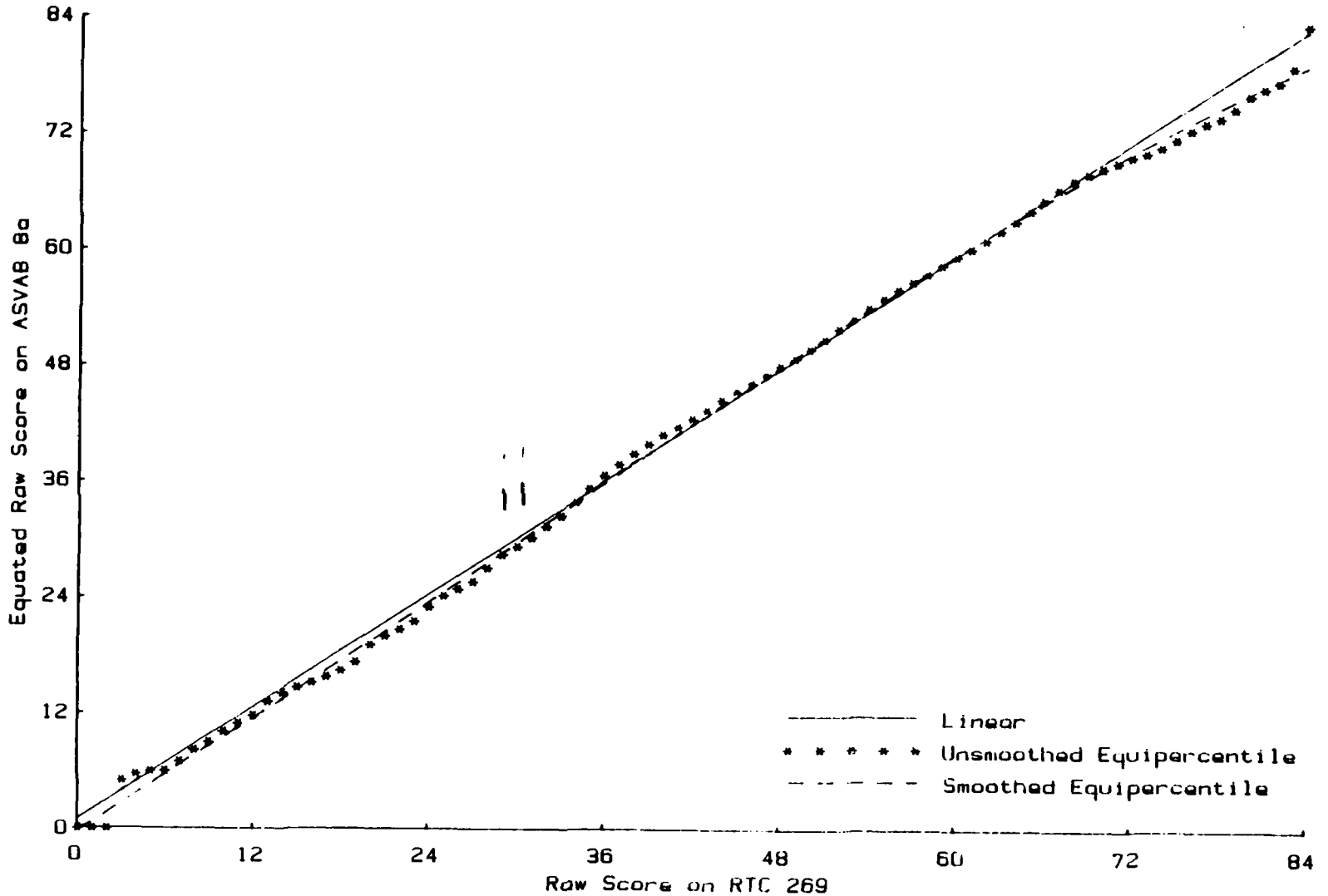
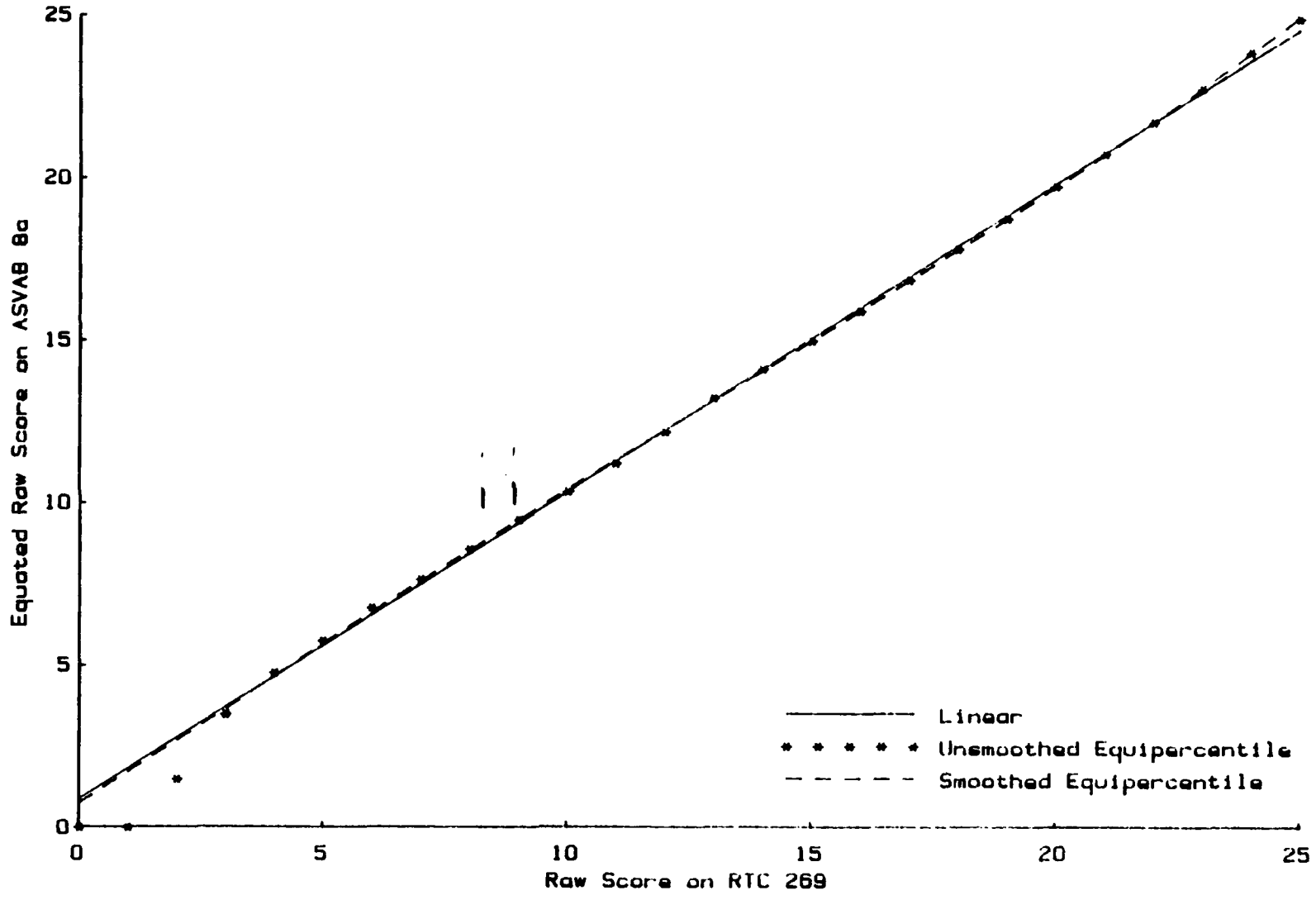


Figure A-18. Equating Transformations for Raw Coding Speed Scores from RTC 269 (ASVAB 11b).



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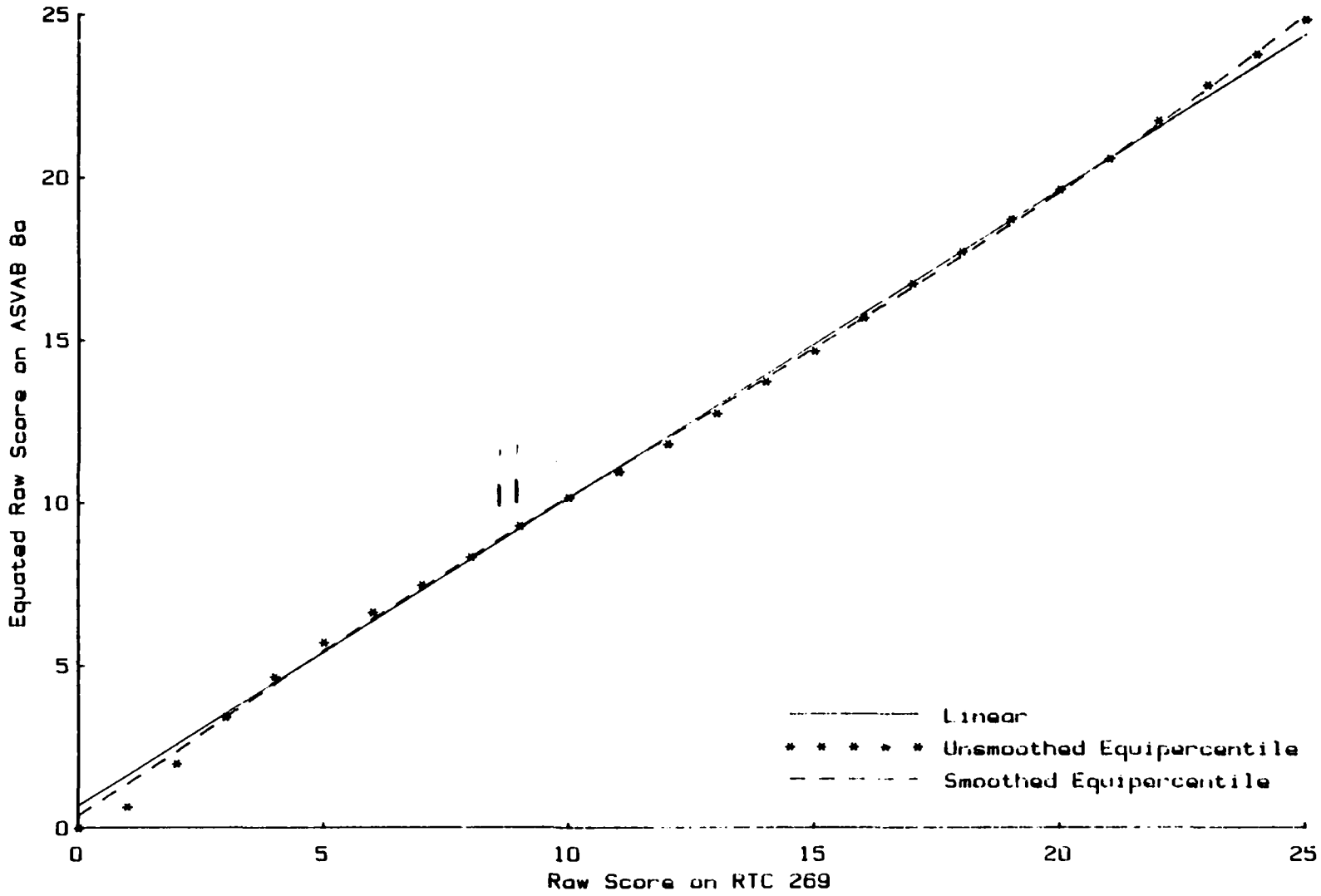


Figure A-20. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 269 (ASVAB 11b).

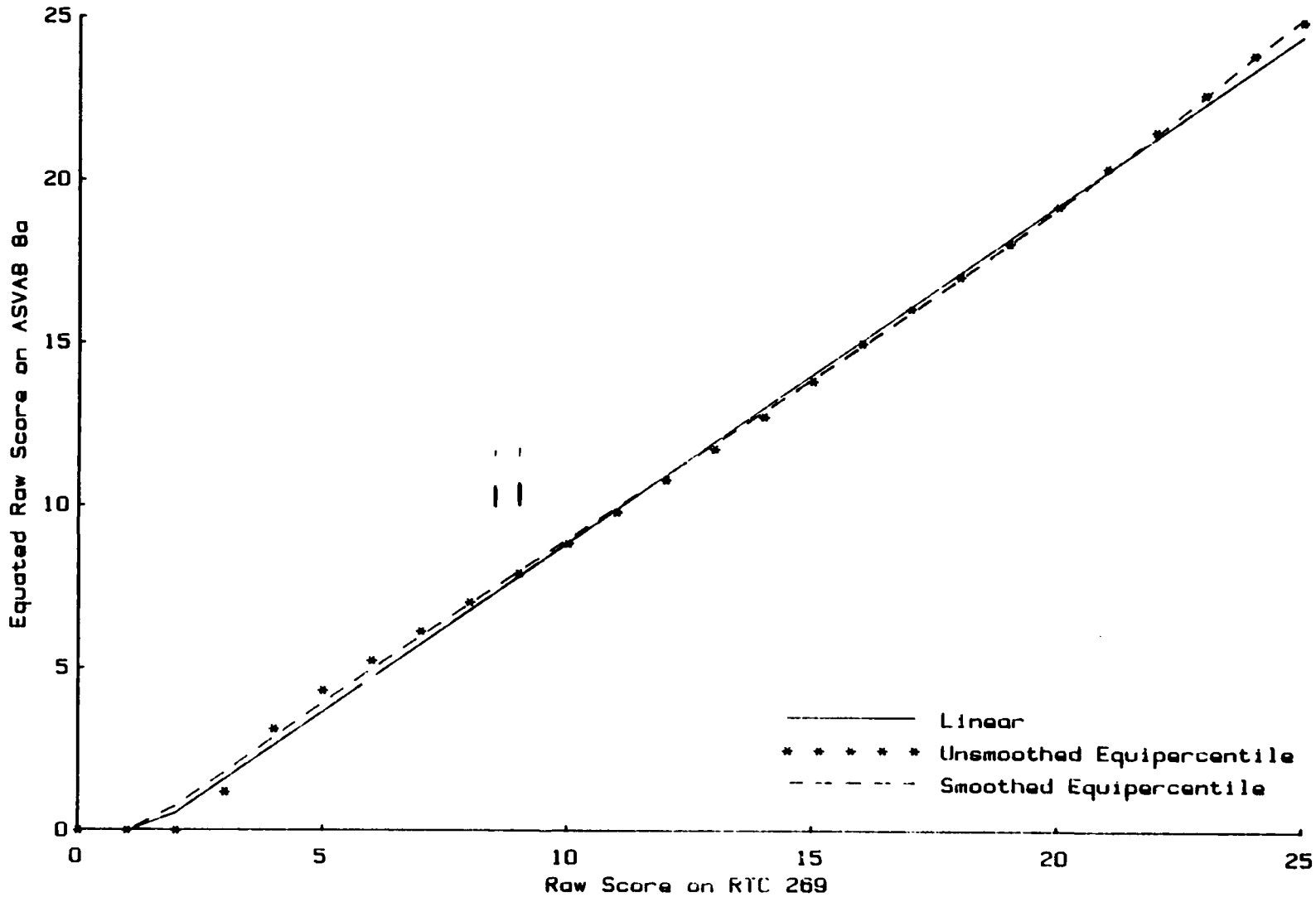
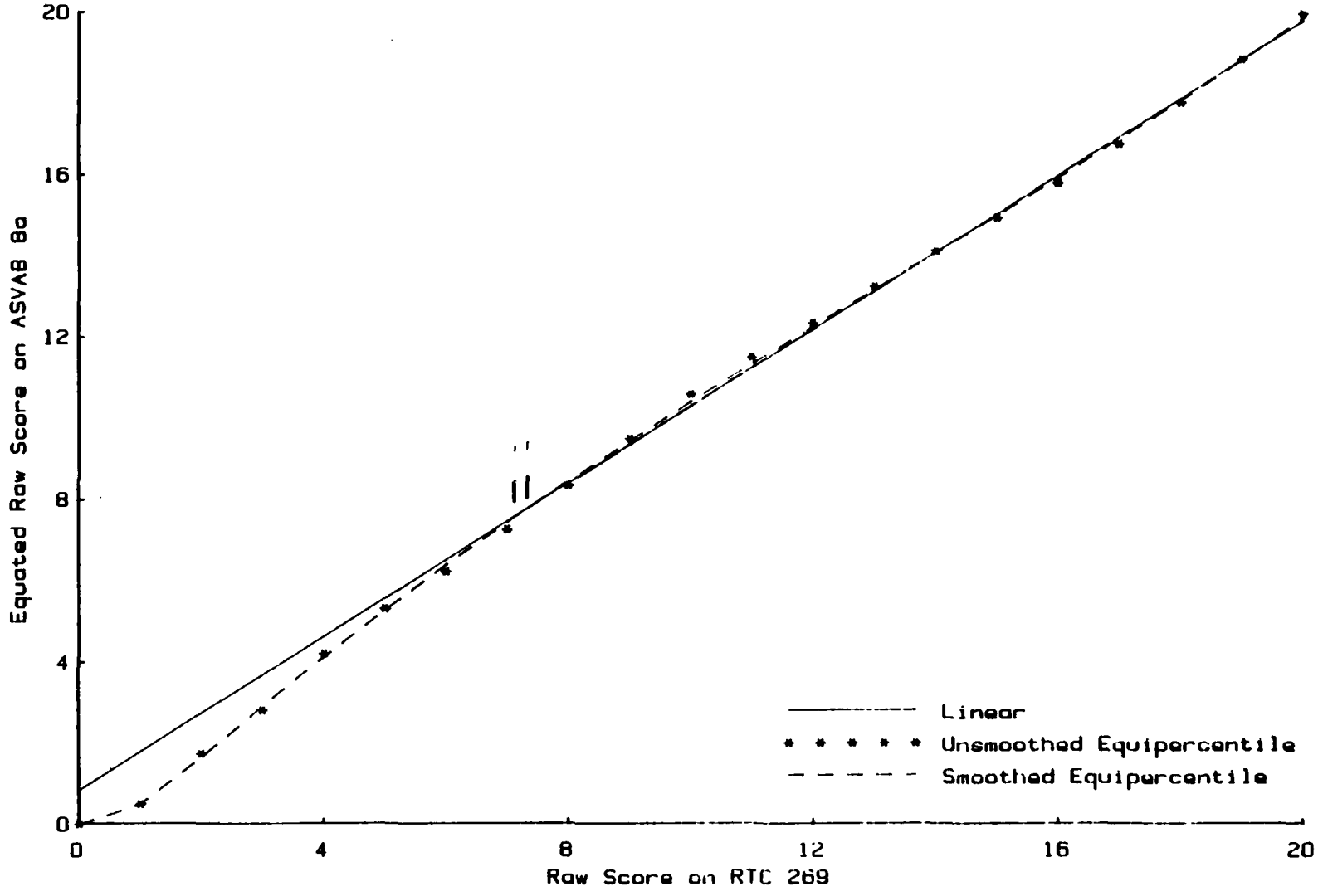


Figure A-21. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 269 (ASVAB 11b).



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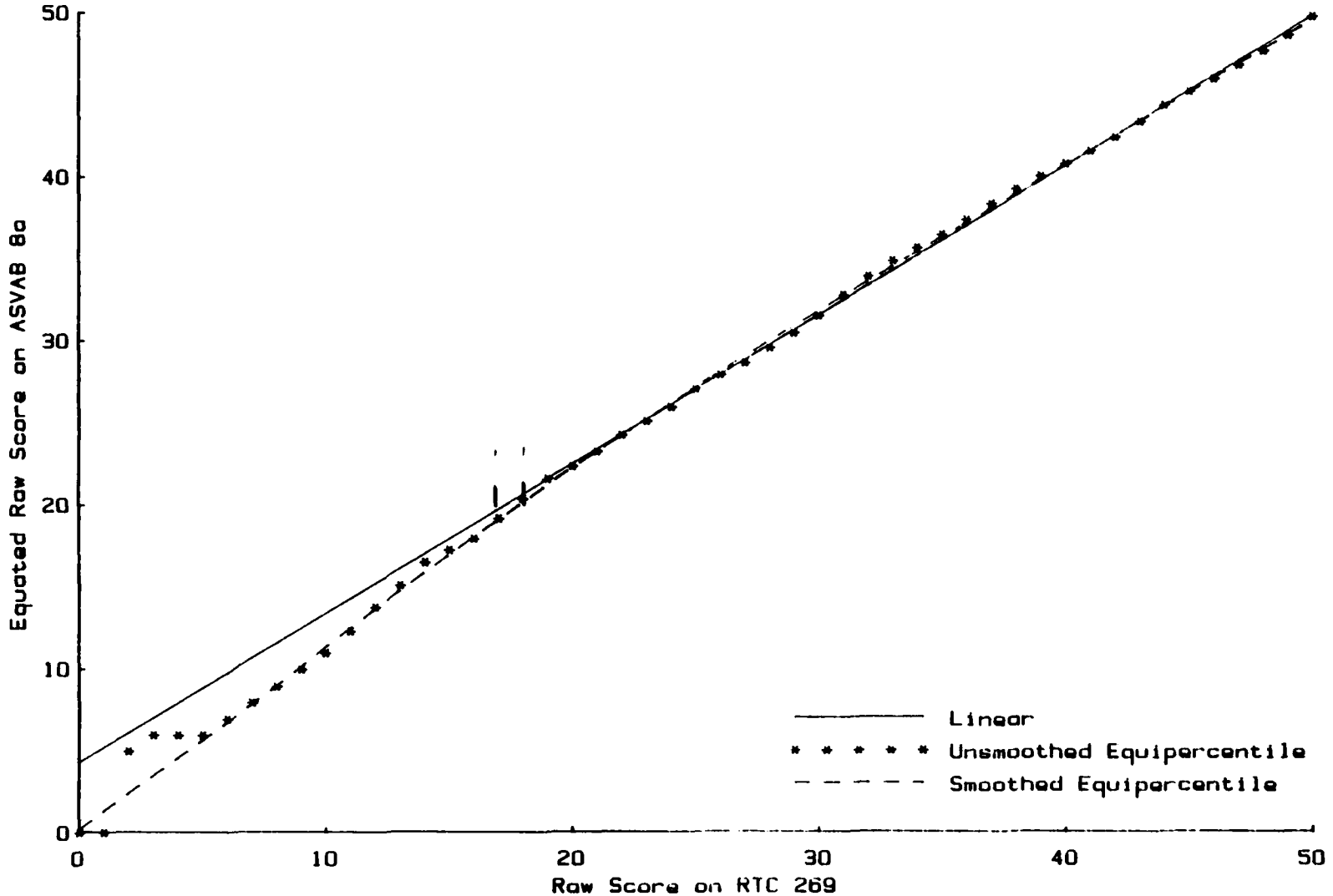

Figure A-23. Equating Transformations for Raw Verbal Composite Scores from RTC 269 (ASVAB 11b).

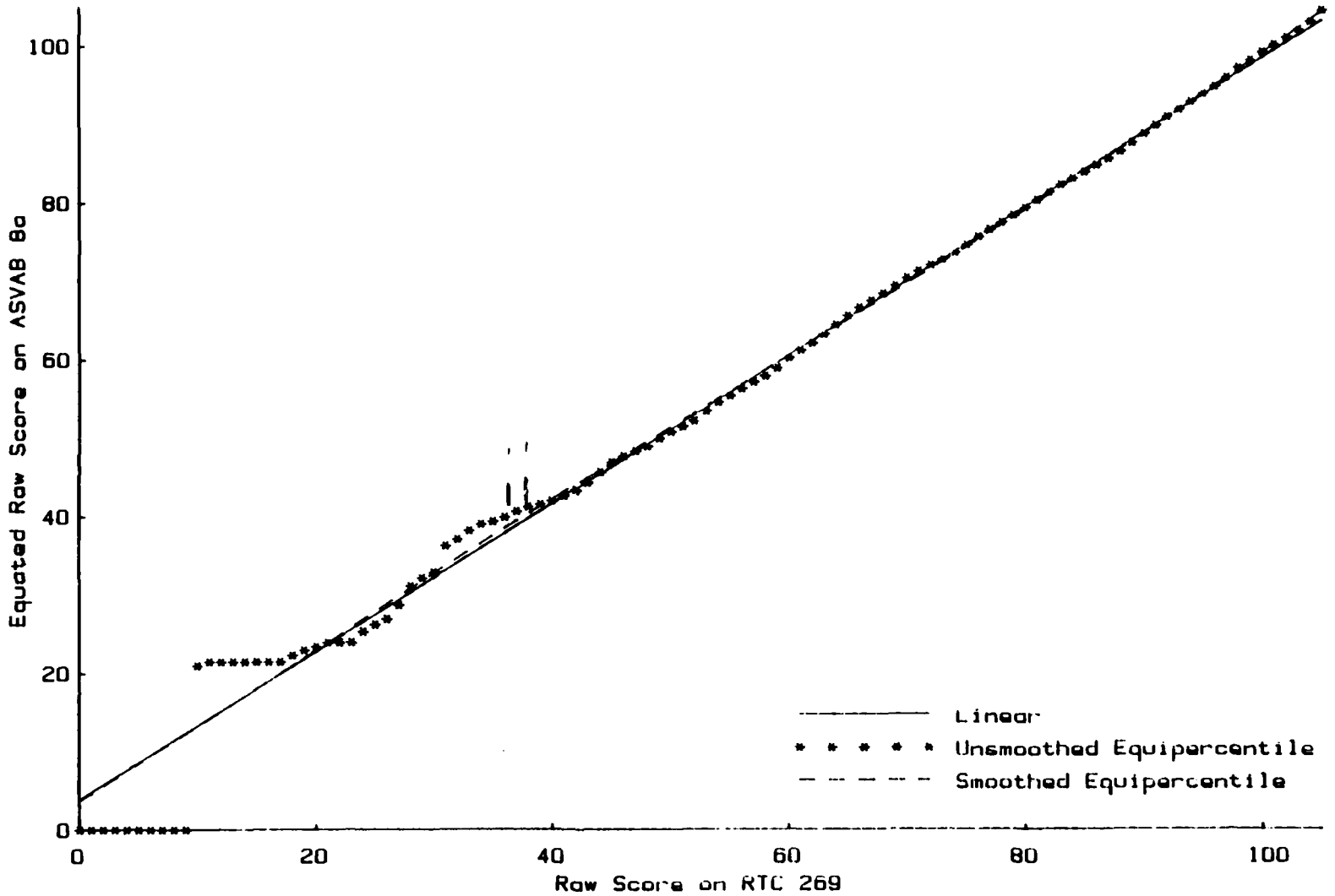

Figure A-24. Equating Transformations for Raw AFQT Composite Scores from RTC 269 (ASVAB 11b).

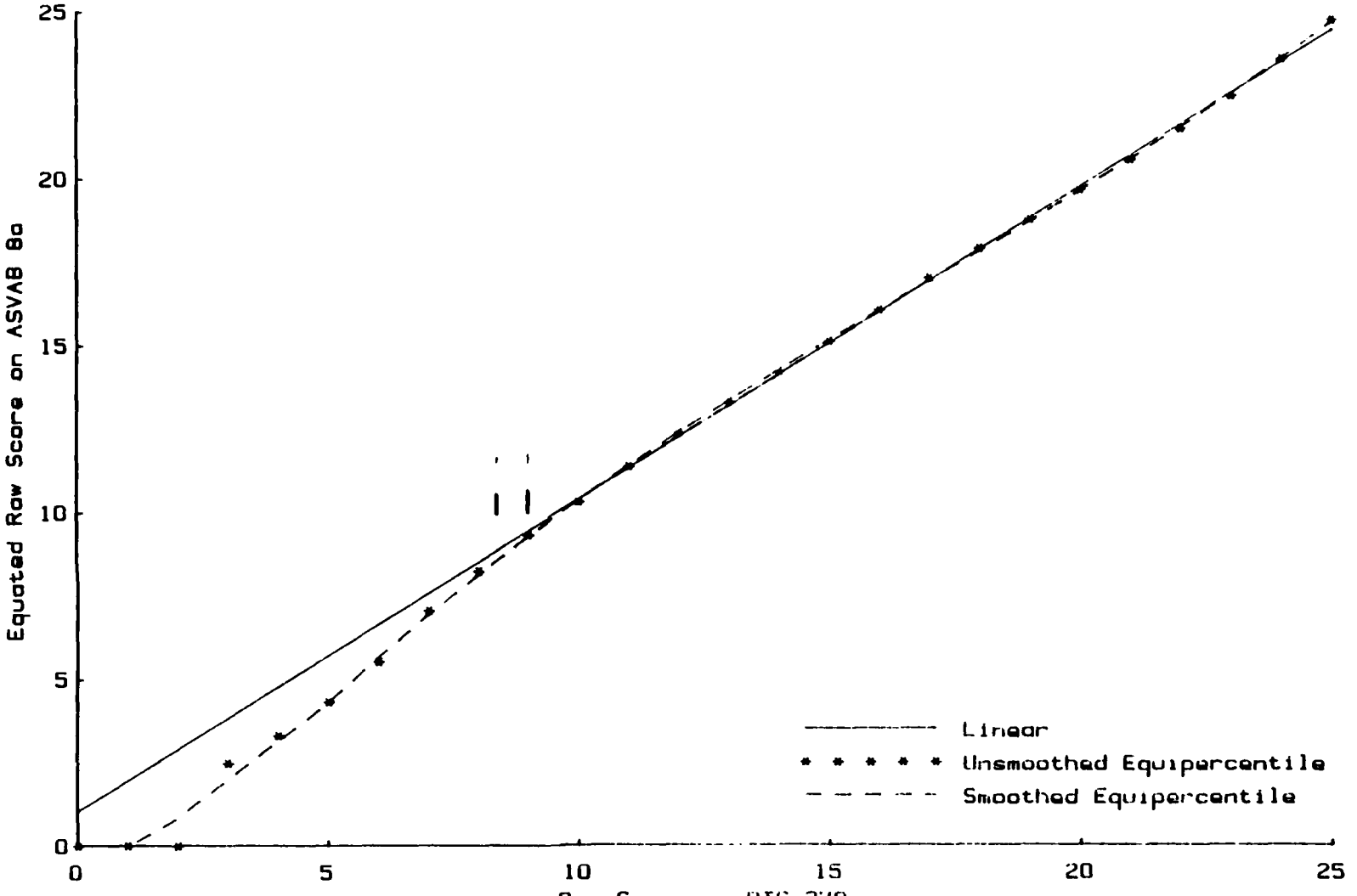

Figure A-25. Equating Transformations for Raw General Science Scores from RTC 370 (ASVAB 12a).

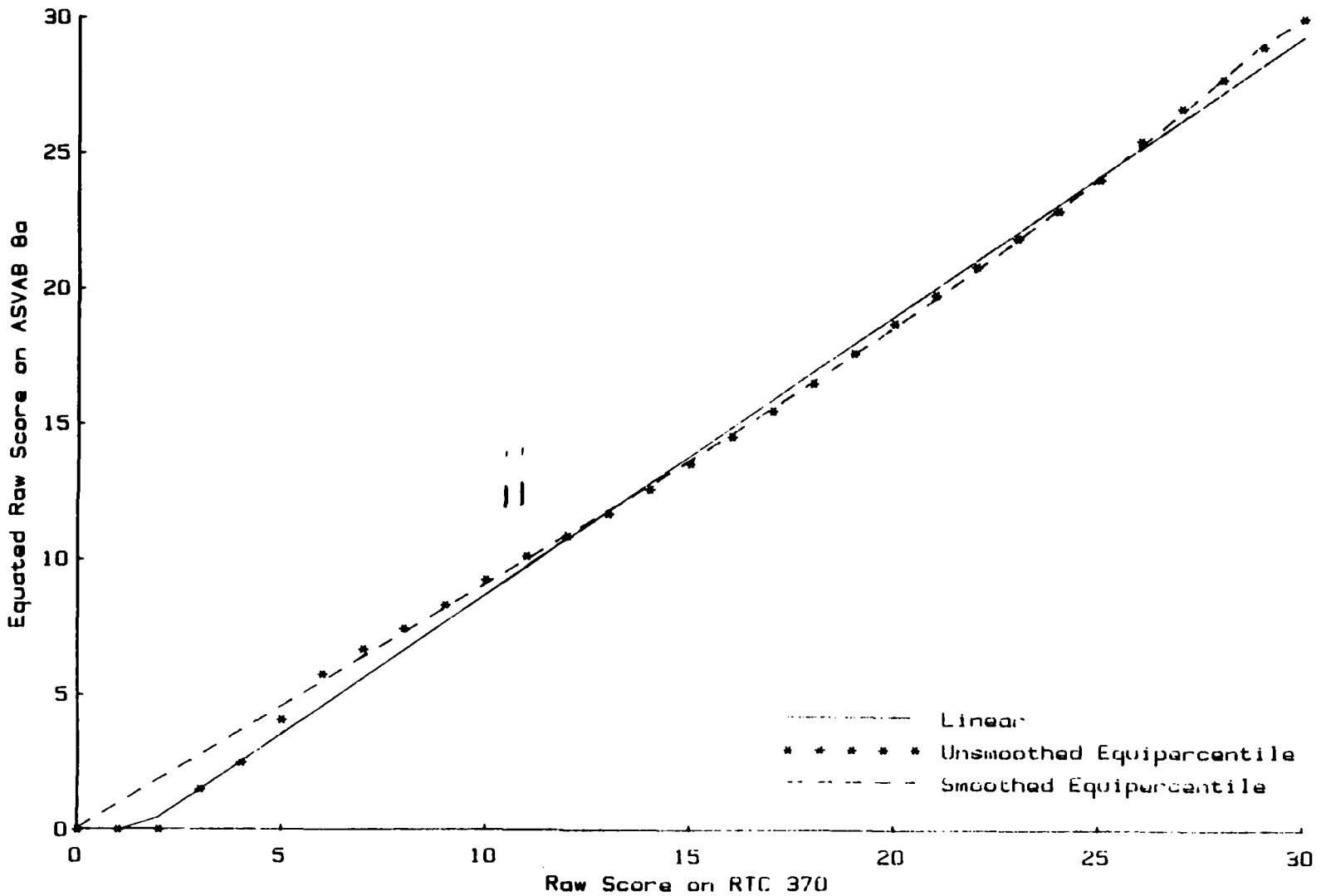

Figure A-26. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 370 (ASVAB 12a).

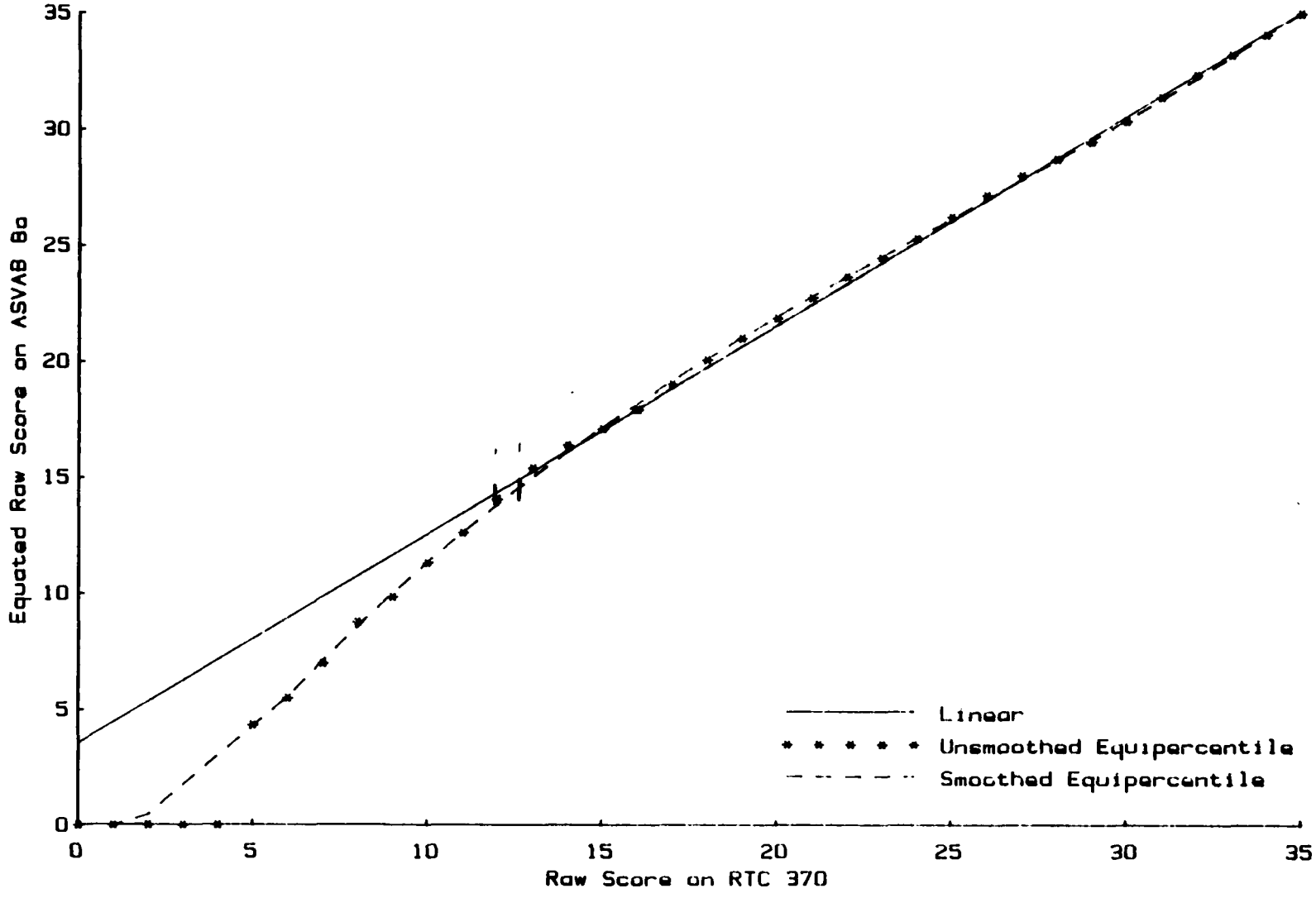

Figure A-27. Equating Transformations for Raw Word Knowledge Scores from RTC 370 (ASVAB 12a).

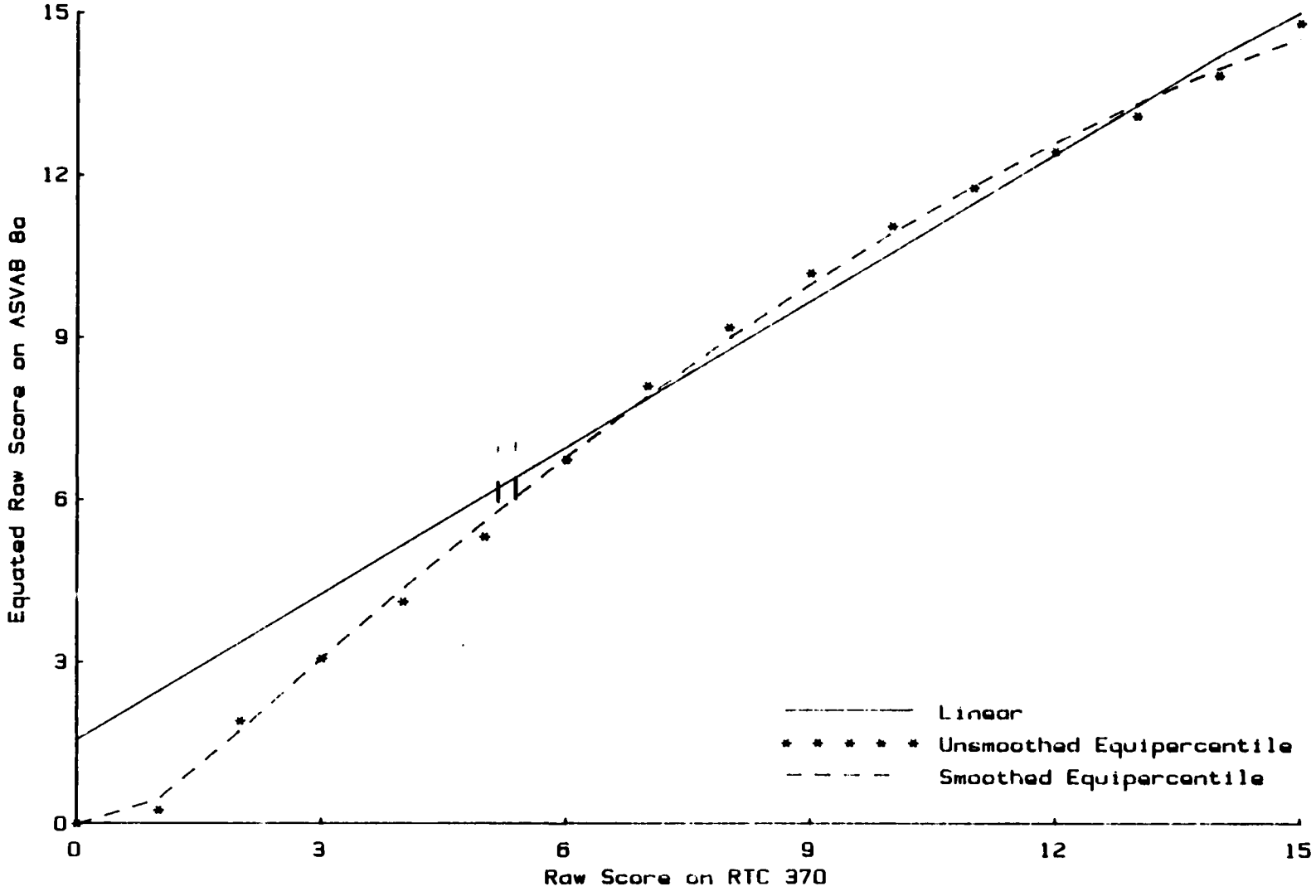

Figure A-28. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 370 (ASVAB 12a).

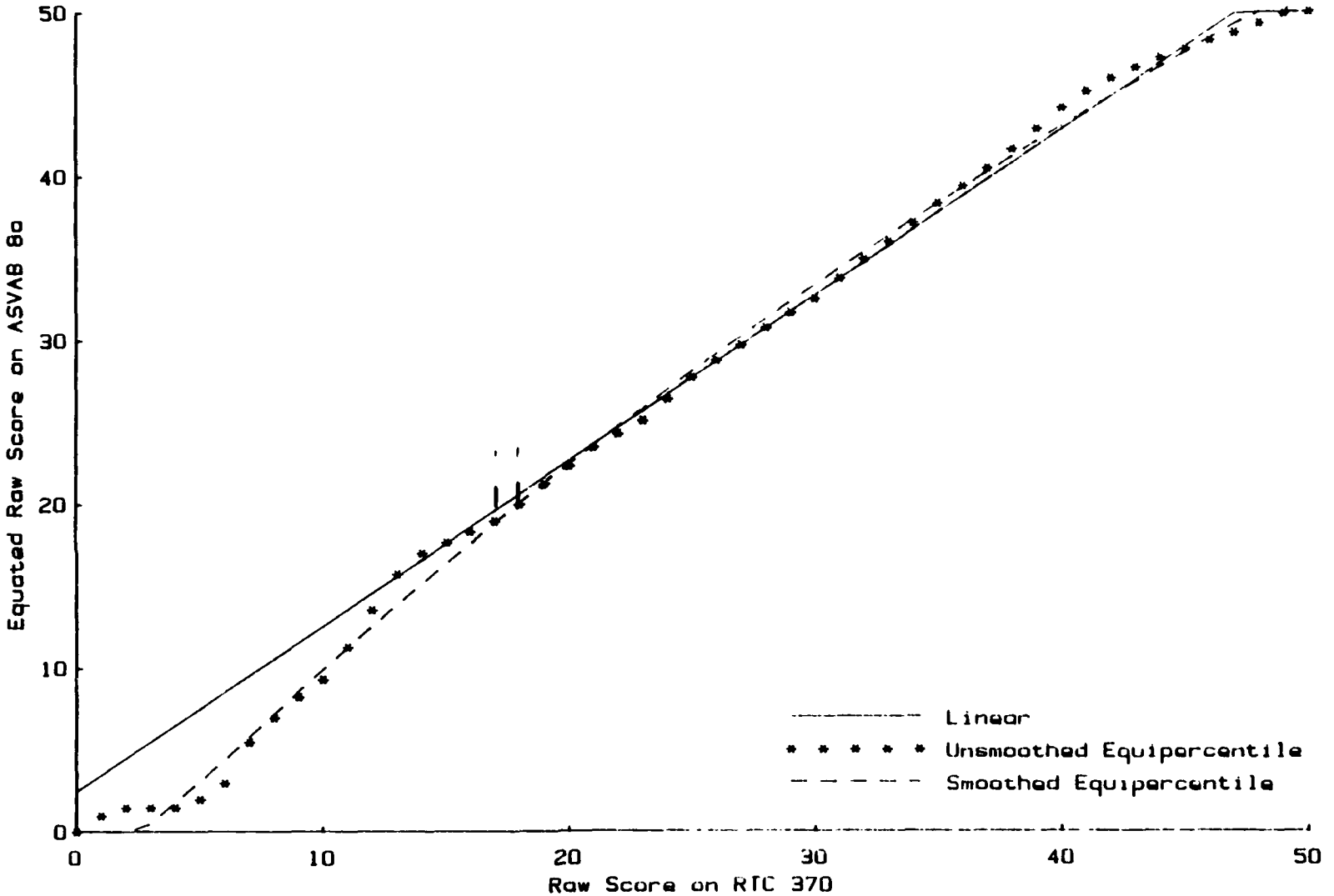

Figure A-29. Equating Transformations for Raw Numerical Operations Scores from RTC 370 (ASVAB 12a).

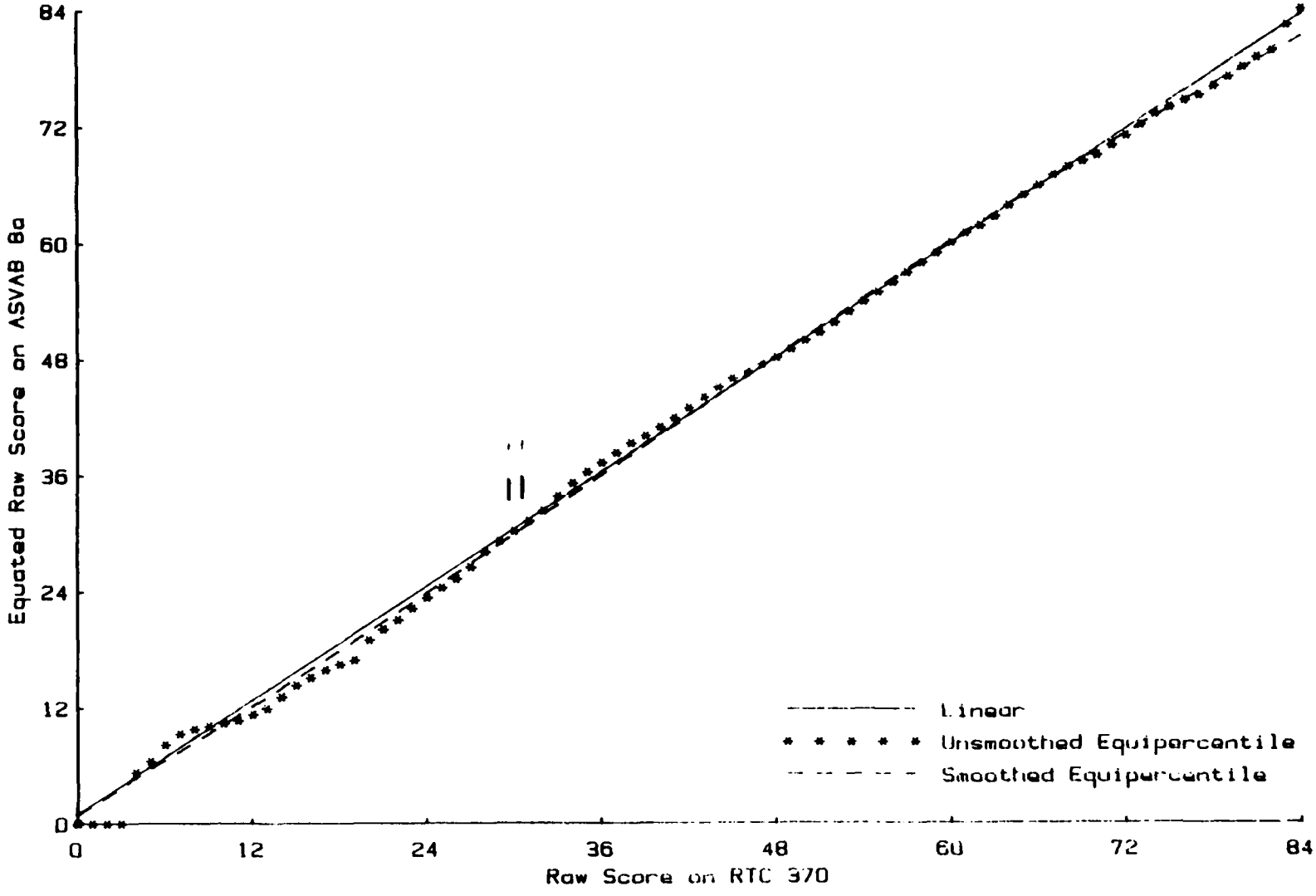

Figure A-30. Equating Transformations for Raw Coding Speed Scores from RTC 370 (ASVAB 12a).

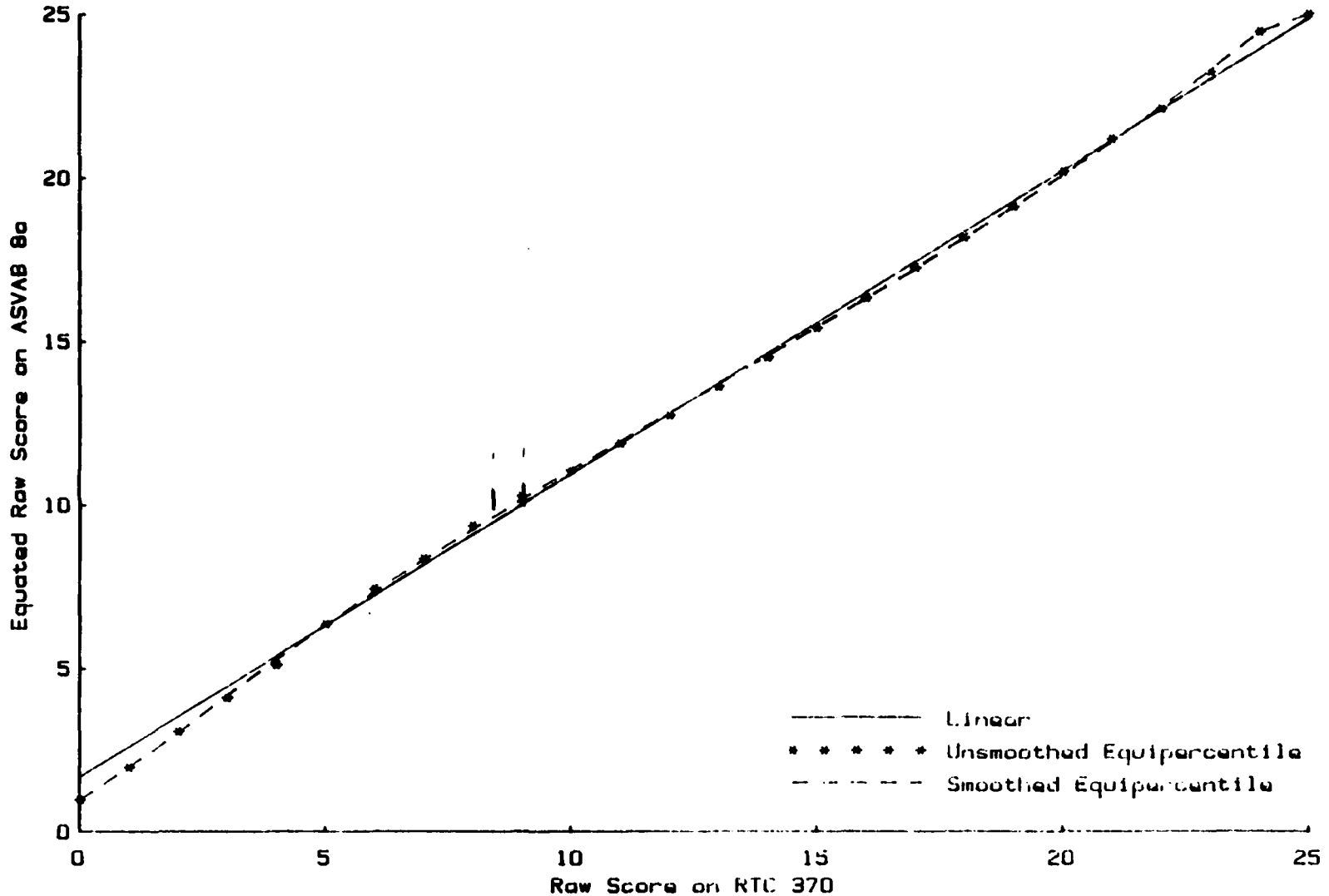

Figure A-31. Equating Transformations for Raw Auto & Shop Information Scores from RTC 370 (ASVAB 12a).

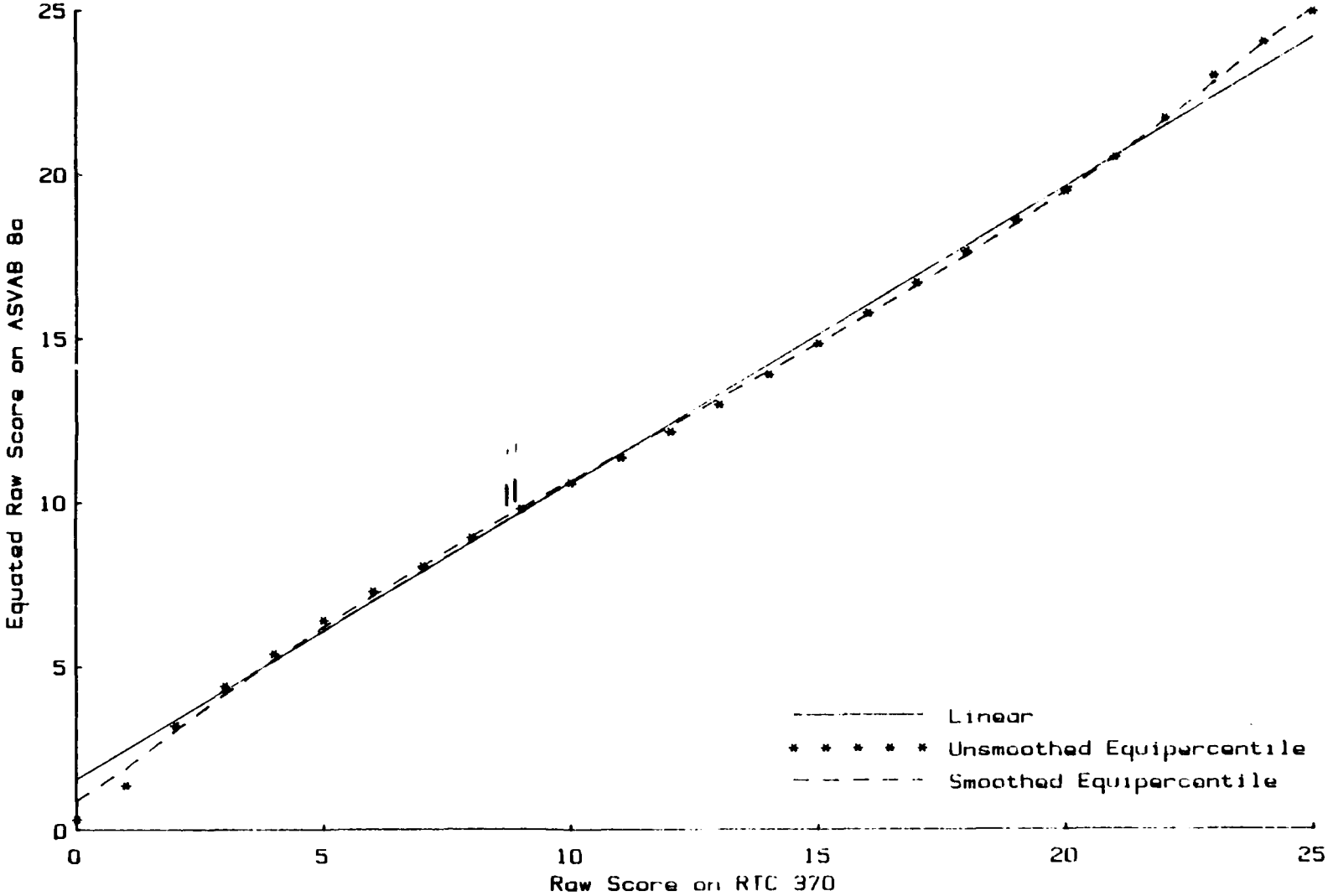

Figure A-32. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 370 (ASVAB 12a).

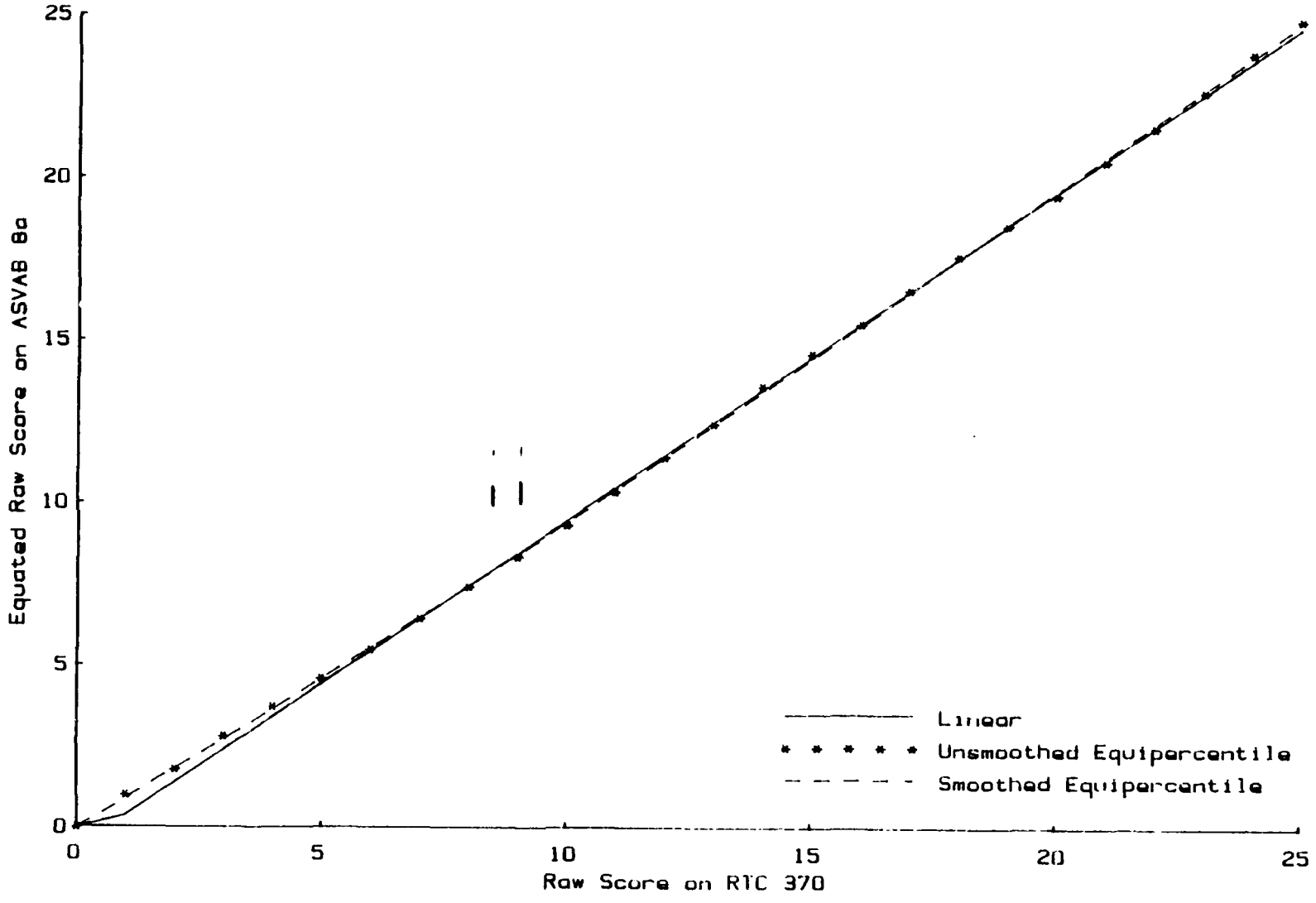

Figure A-33. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 370 (ASVAB 12a).

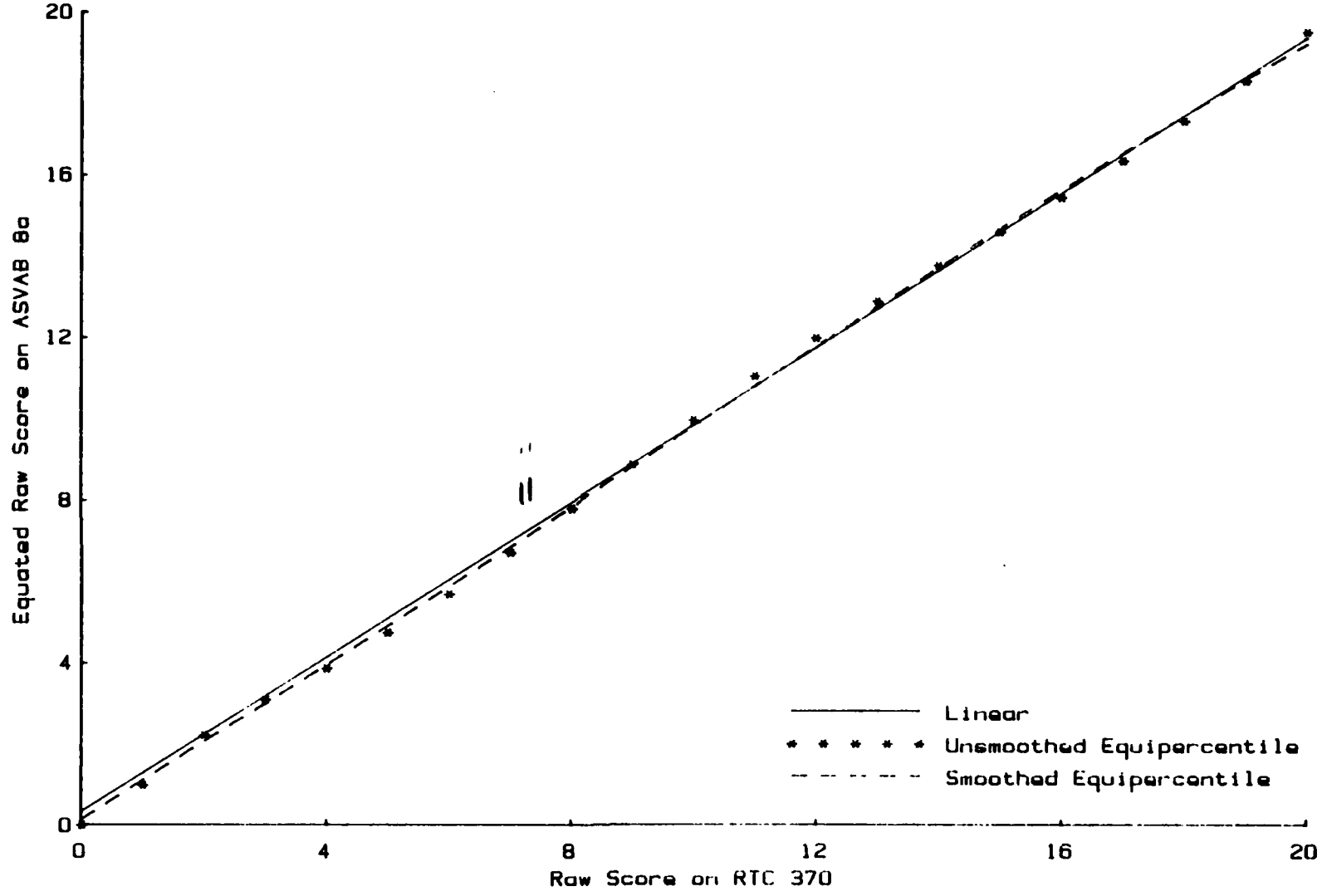

Figure A-34. Equating Transformations for Raw Electronics Information Scores from RTC 370 (ASVAB 12a).

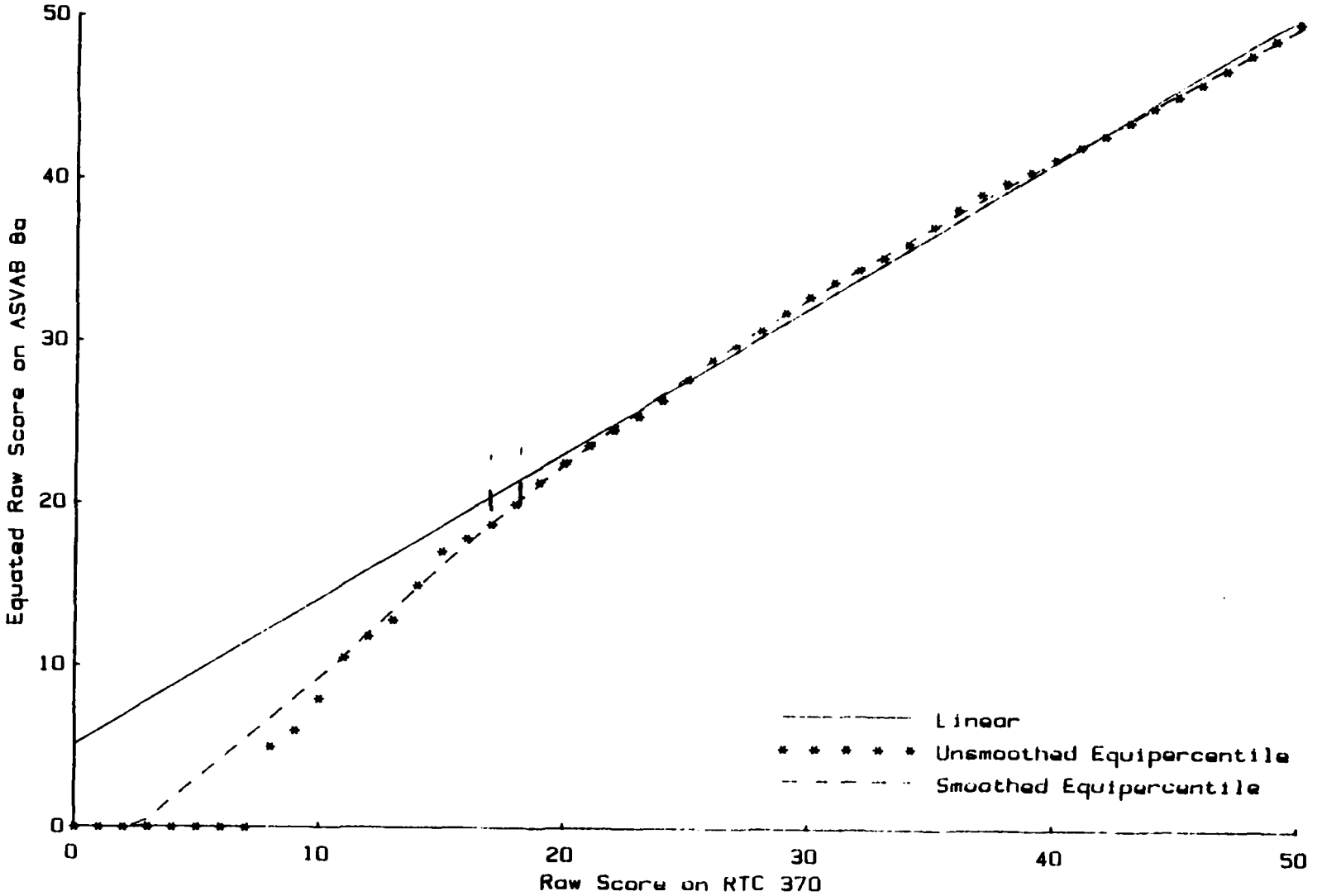

Figure A-35. Equating Transformations for Raw Verbal Composite Scores from RTC 370 (ASVAB 12a).

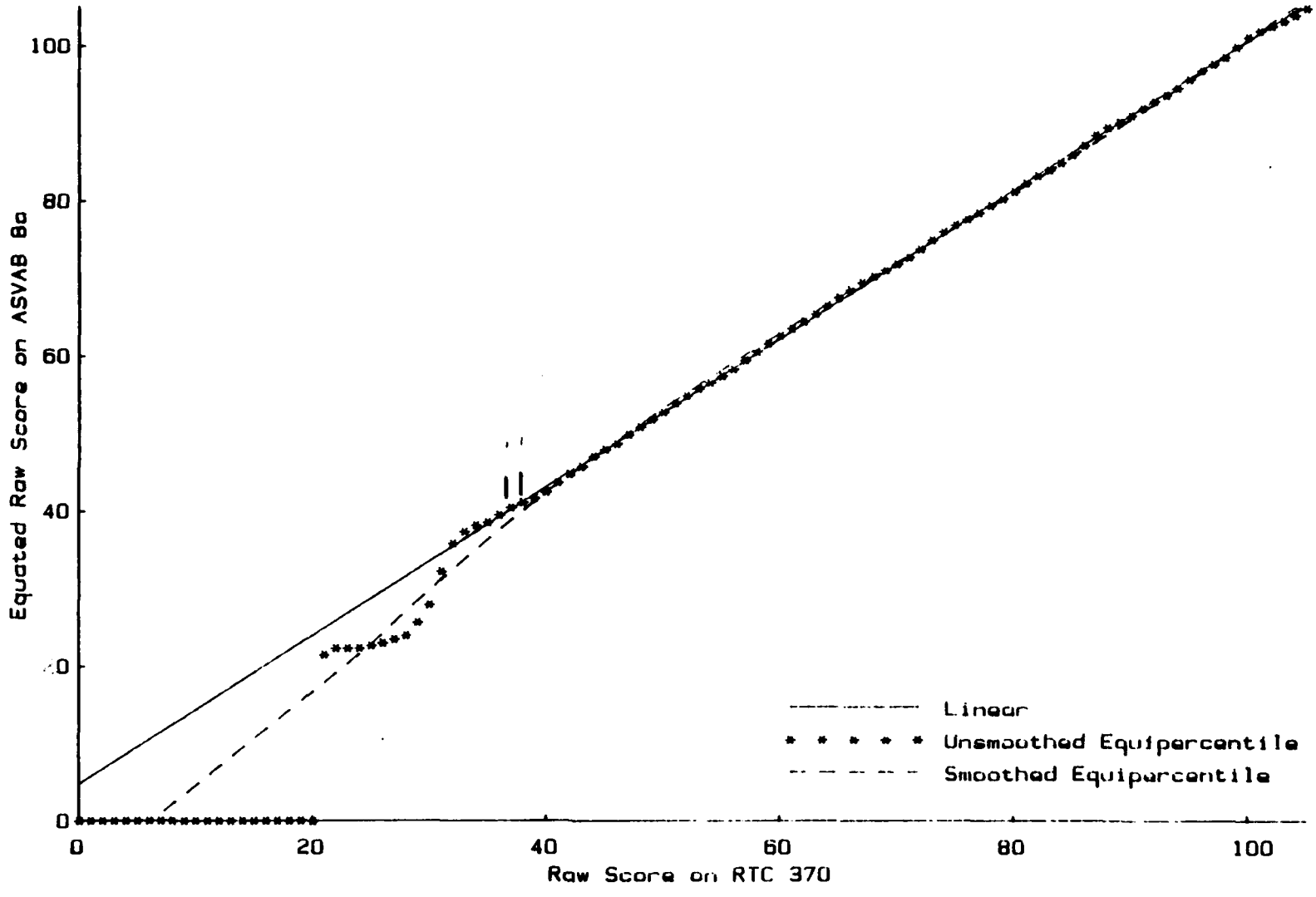

Figure A-36. Equating Transformations for Raw AFQT Composite Scores from RTC 370 (ASVAB 12a).

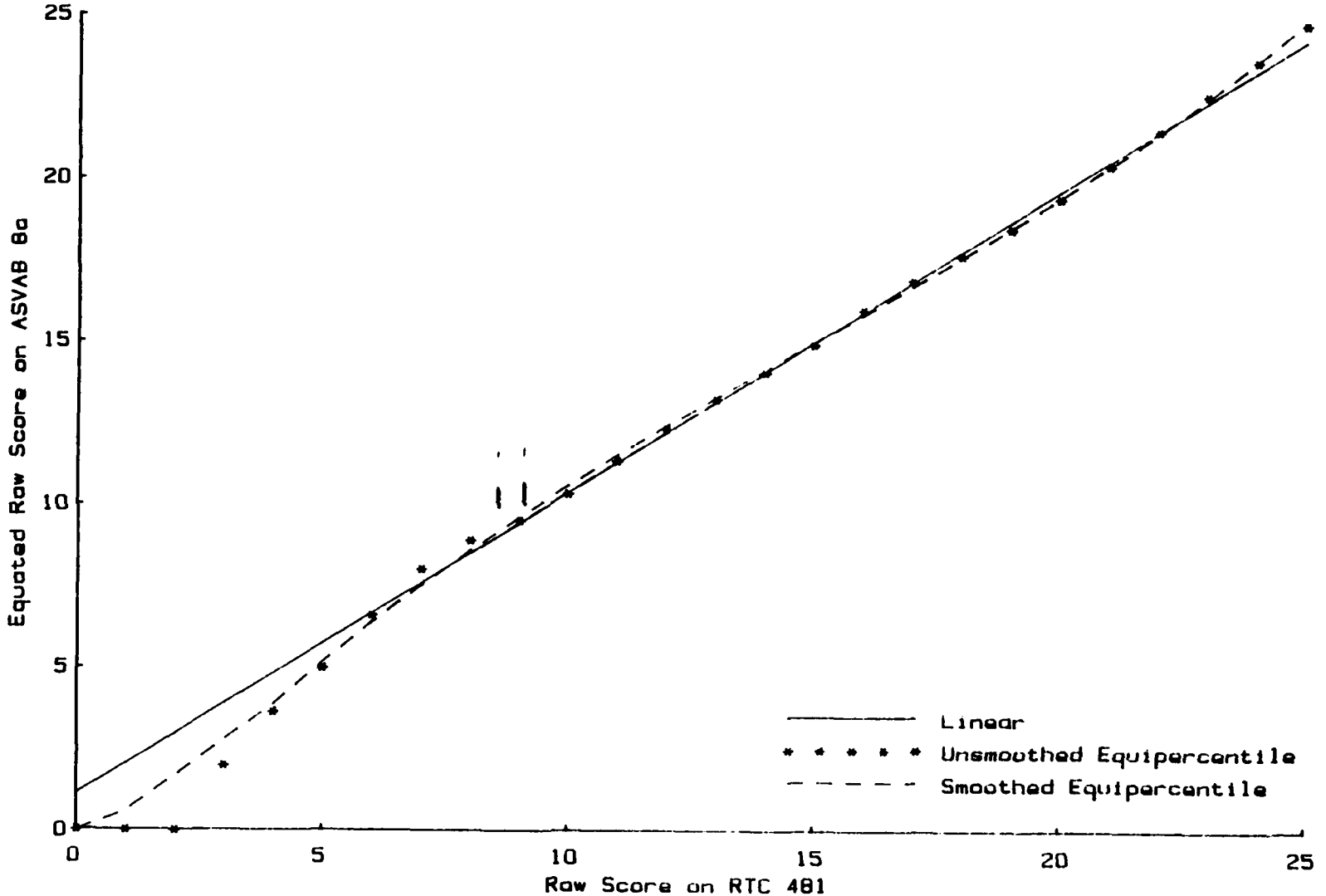

Figure A-37. Equating Transformations for Raw General Science Scores from RTC 481 (ASVAB 12b).

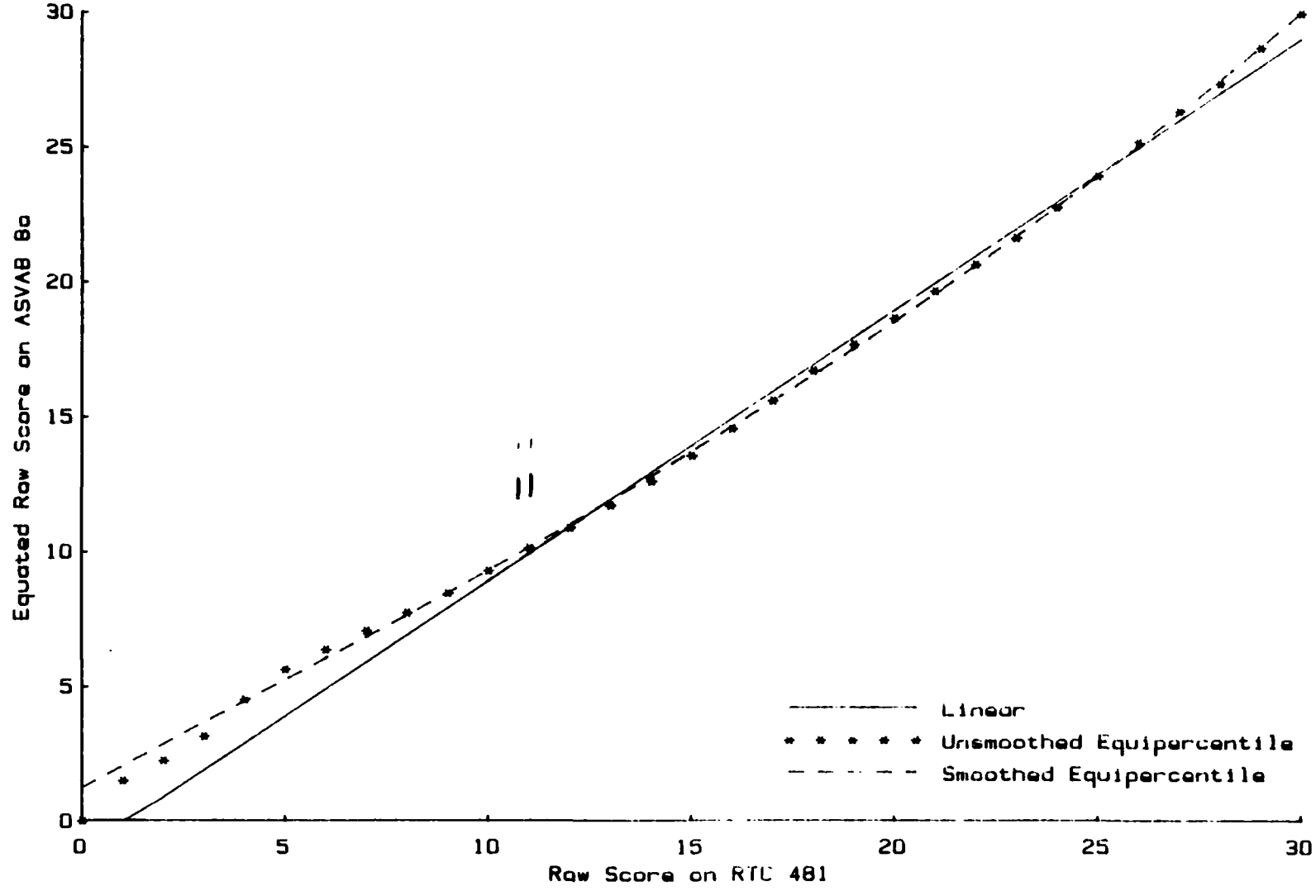

Figure A-38. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 481 (ASVAB 12b).

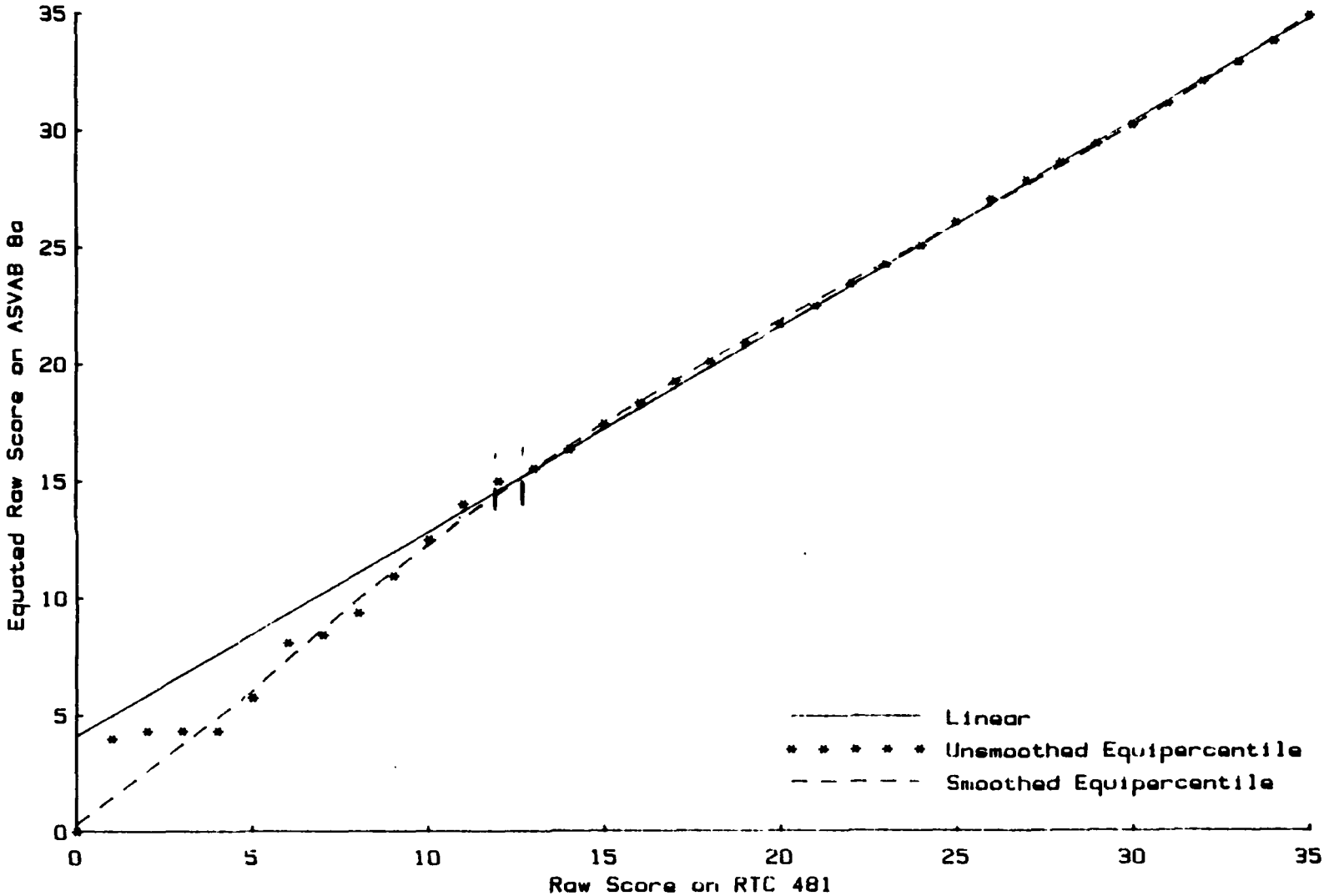

Figure A-39. Equating Transformations for Raw Word Knowledge Scores from RTC 481 (ASVAB 12b).

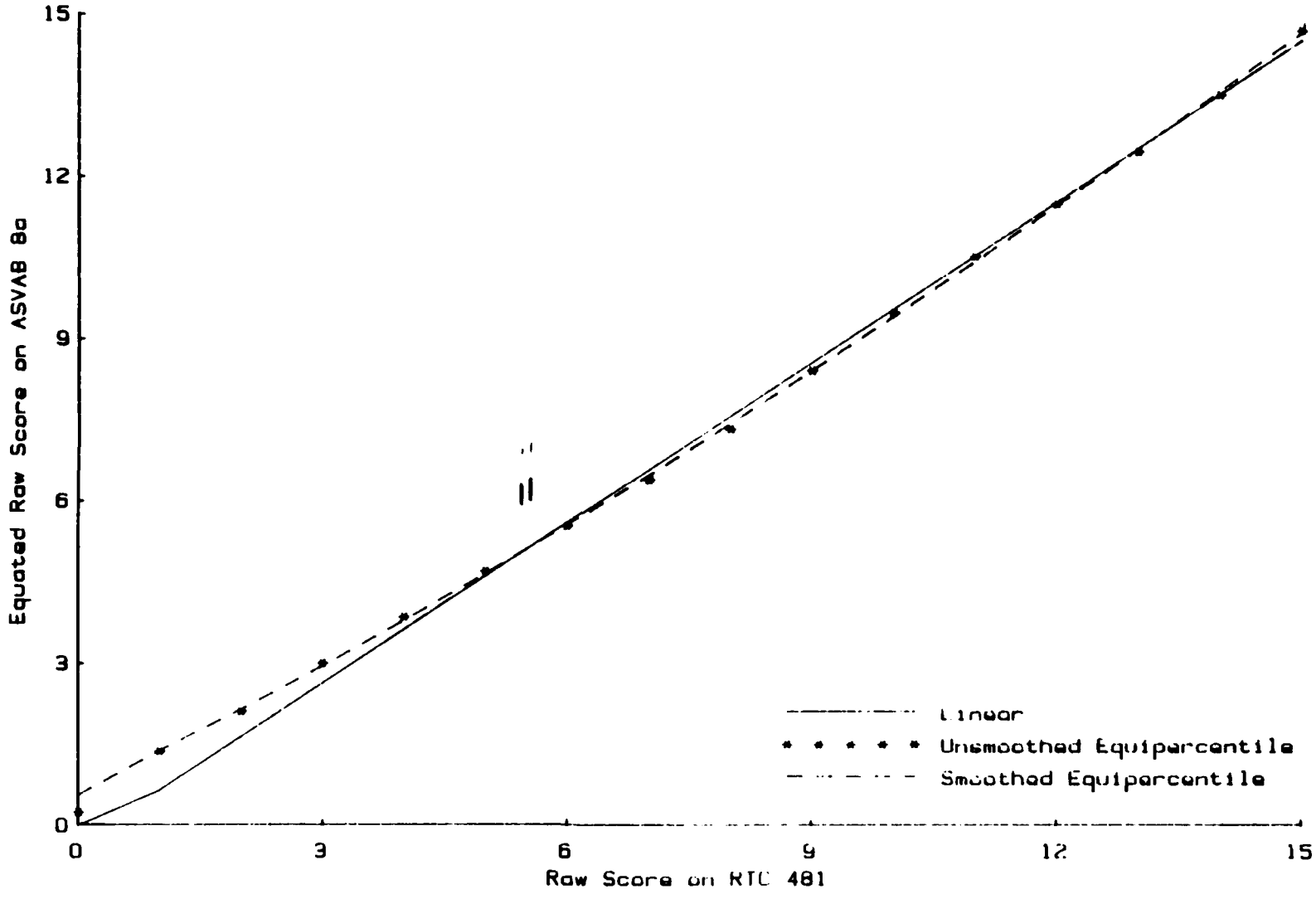

Figure A-40. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 481 (ASVAB 12b).

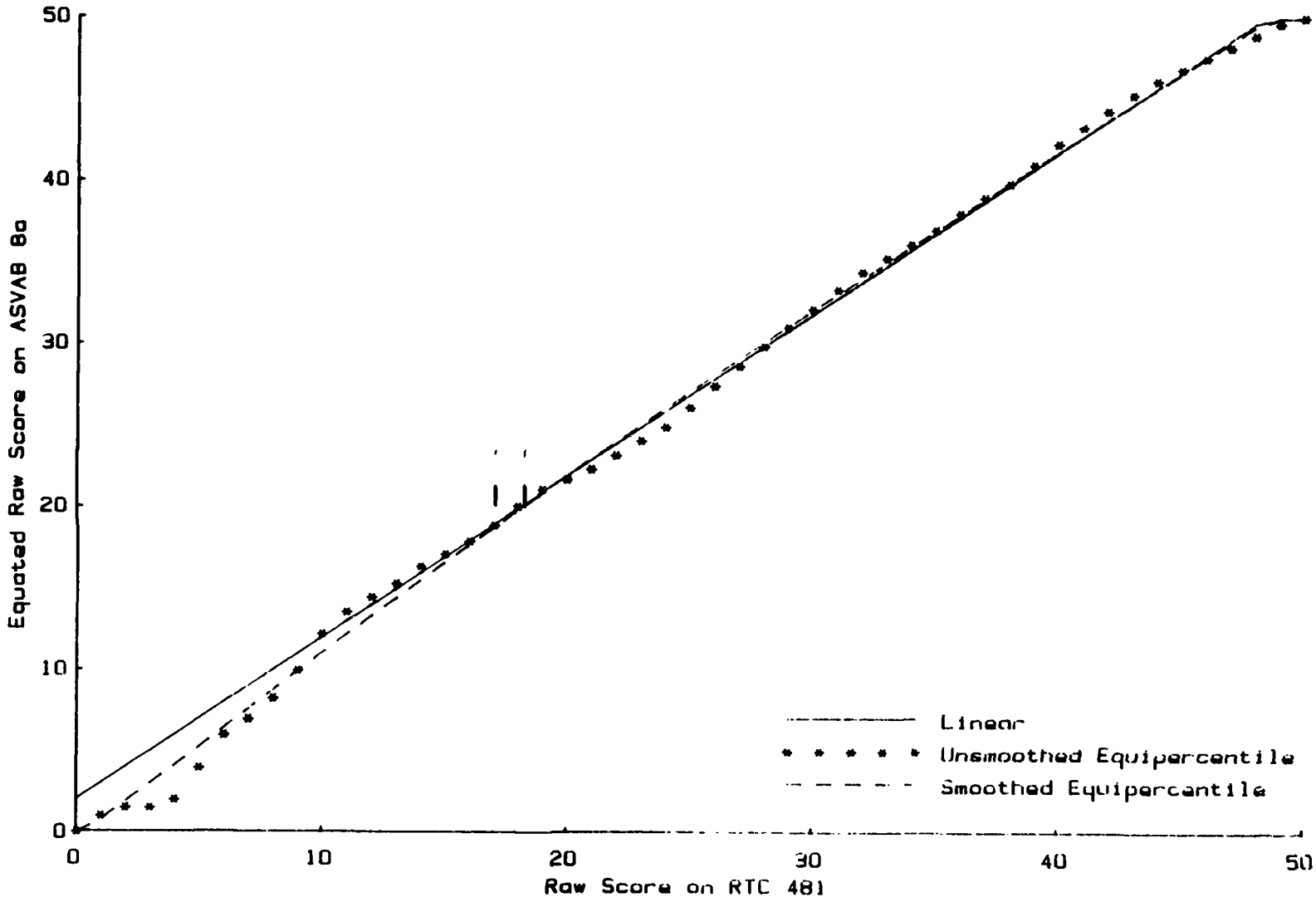

Figure A-41. Equating Transformations for Raw Numerical Operations Scores from RTC 481 (ASVAB 12b).

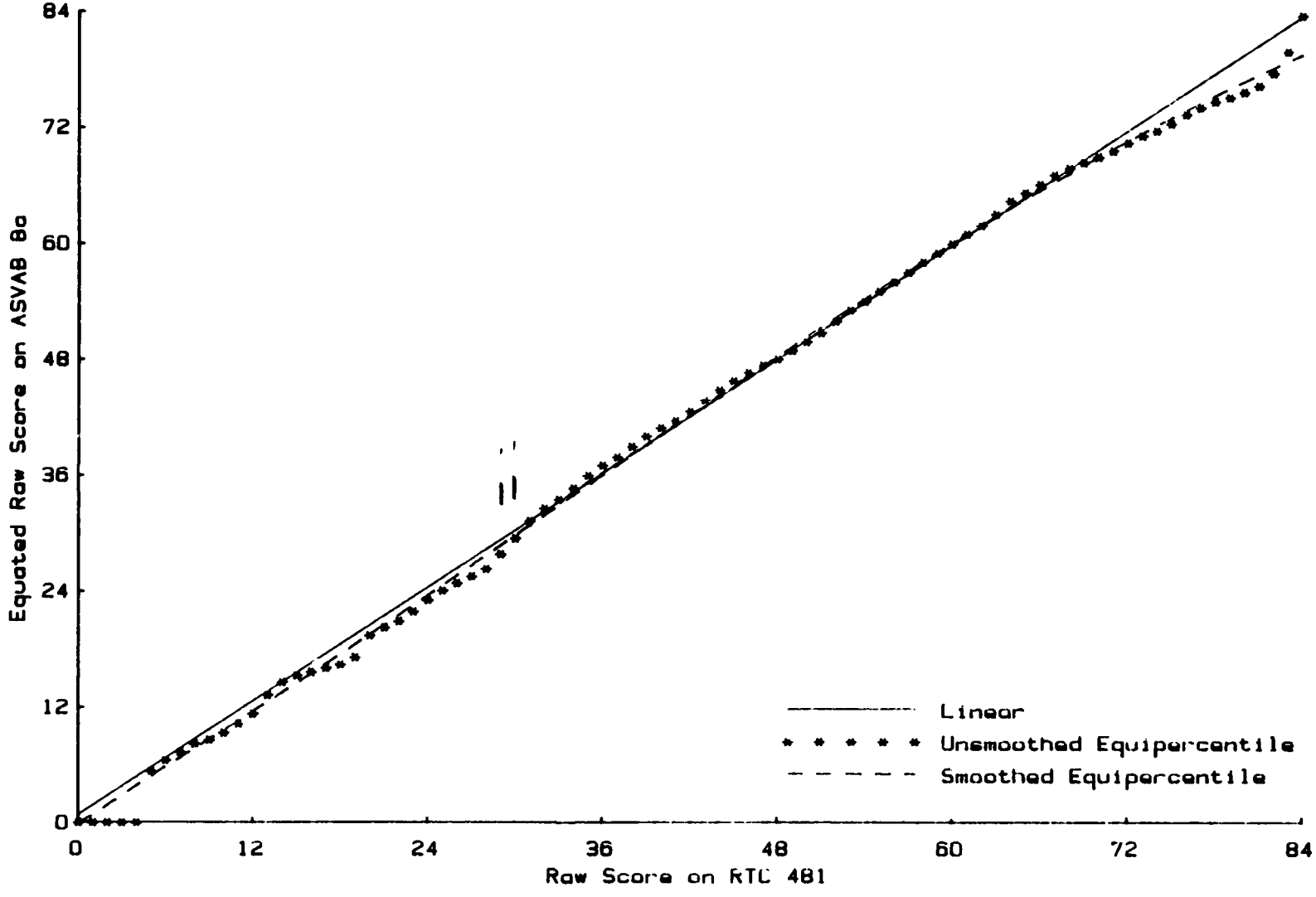

Figure A-42. Equating Transformations for Raw Coding Speed Scores from RTC 481 (ASVAB 12b).

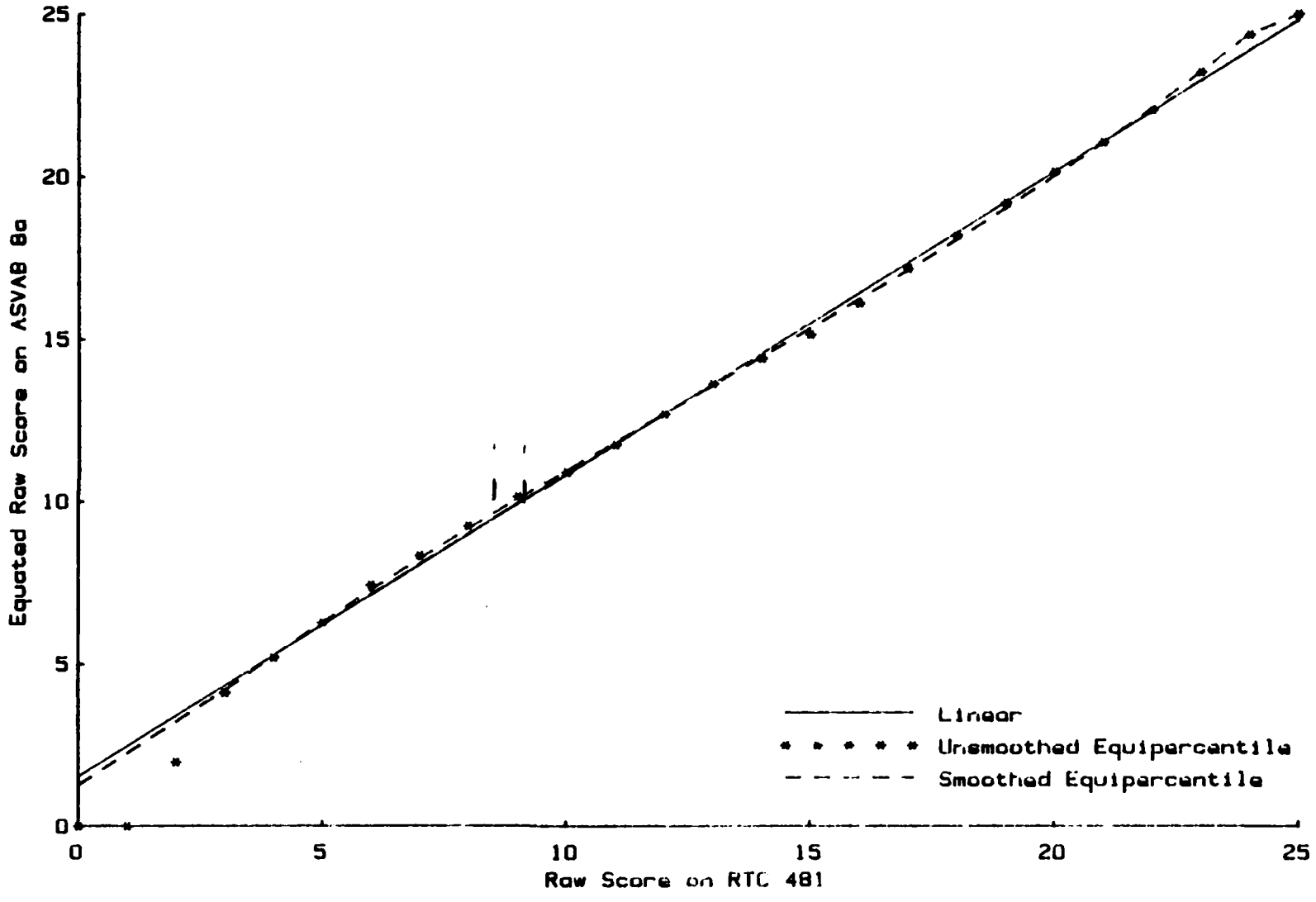

Figure A-43. Equating Transformations for Raw Auto & Shop Information Scores from RTC 481 (ASVAB 12b).

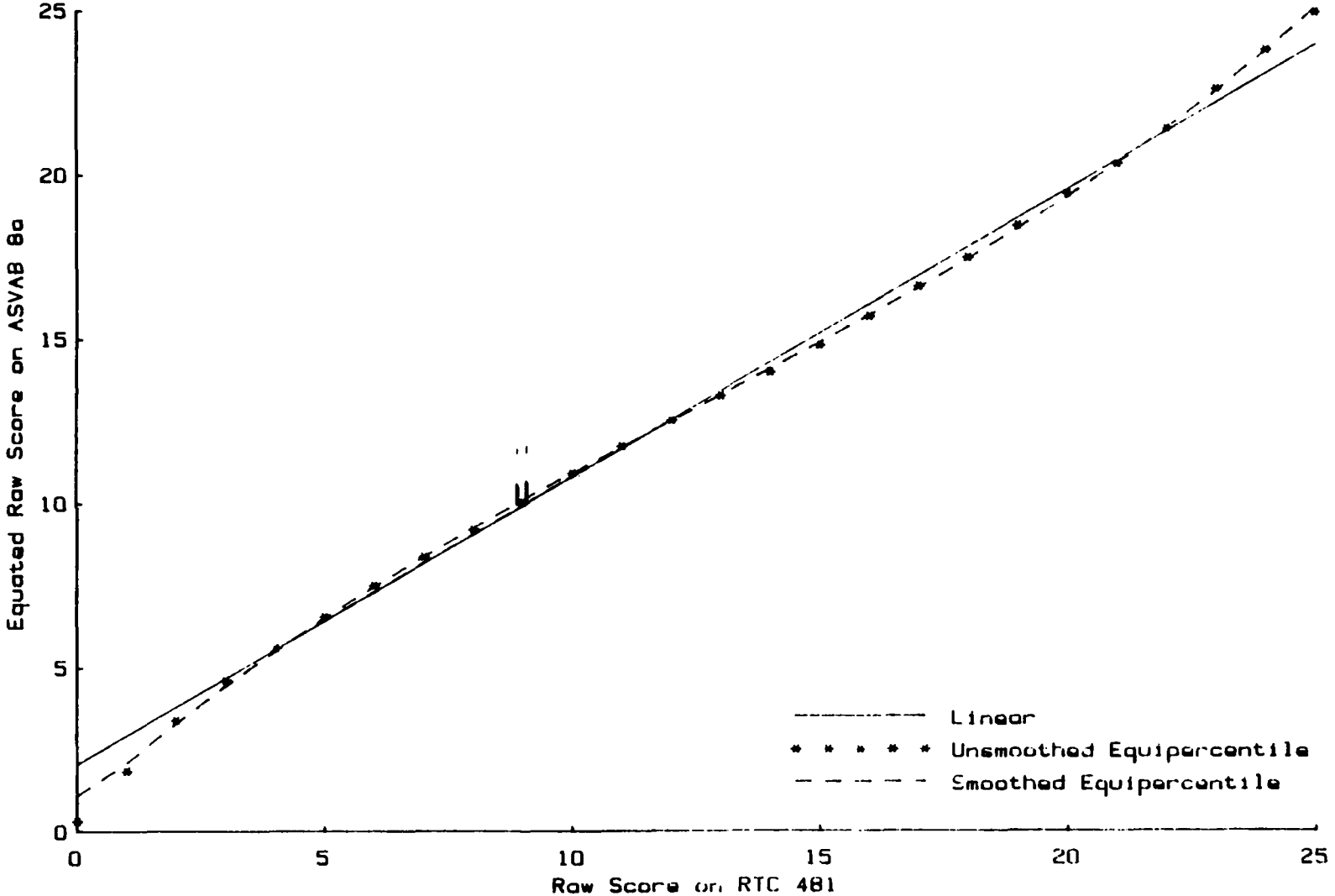

Figure A-44. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 481 (ASVAB 12b).

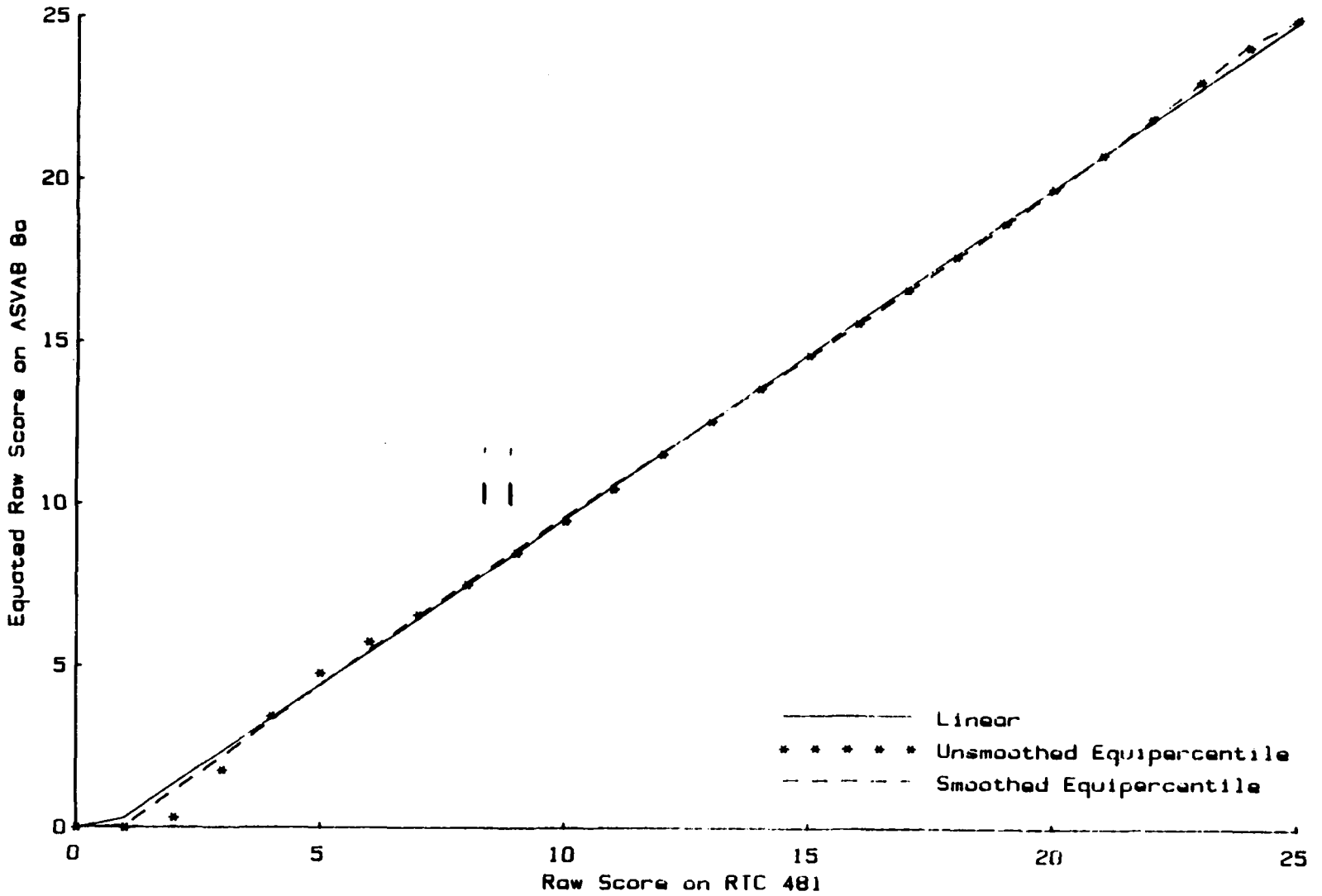

Figure A-45. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 481 (ASVAB 12b).

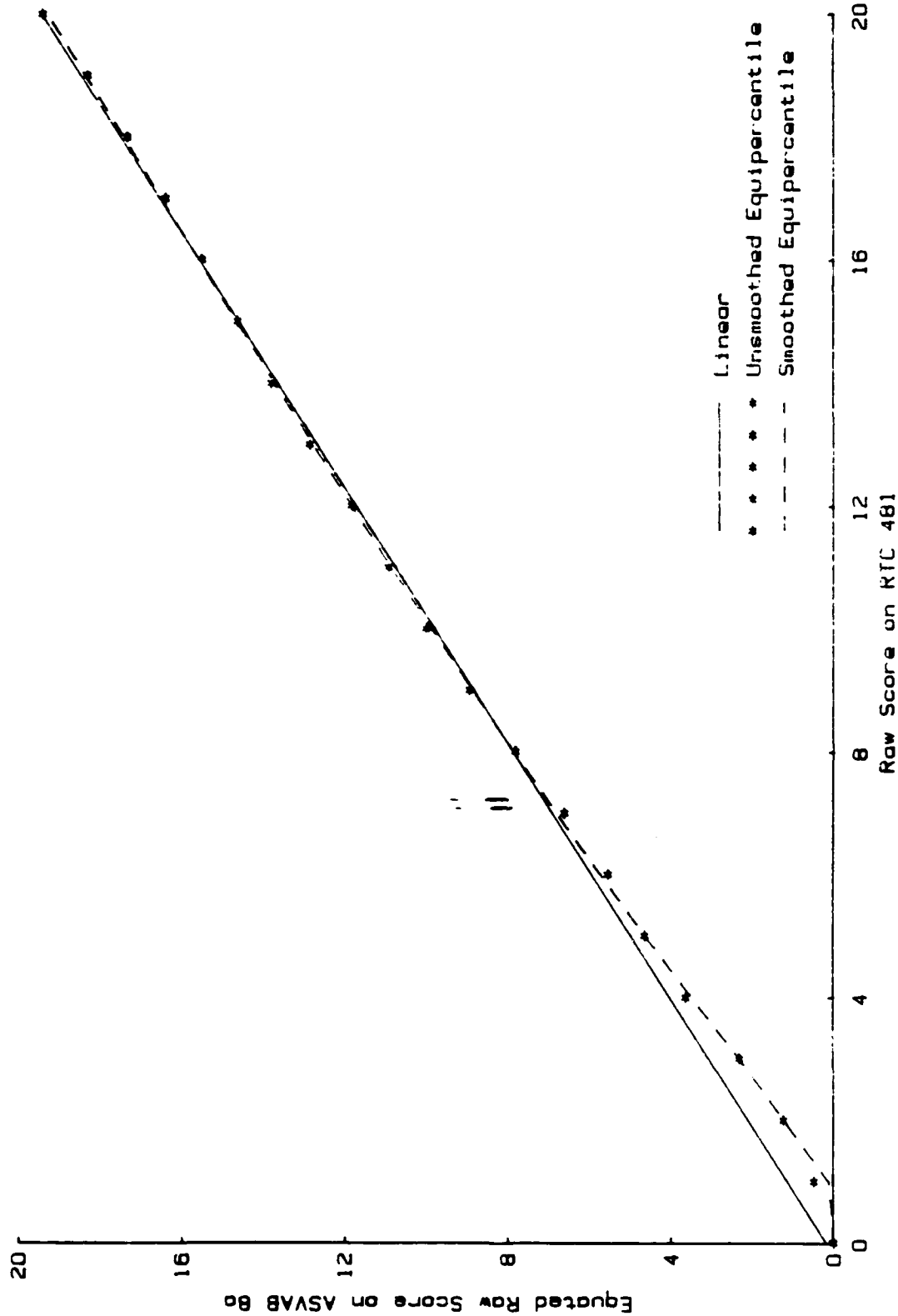

Figure A-46. Equating Transformations for Raw Electronics Information Scores from RTC 481 (ASVAB 12b).

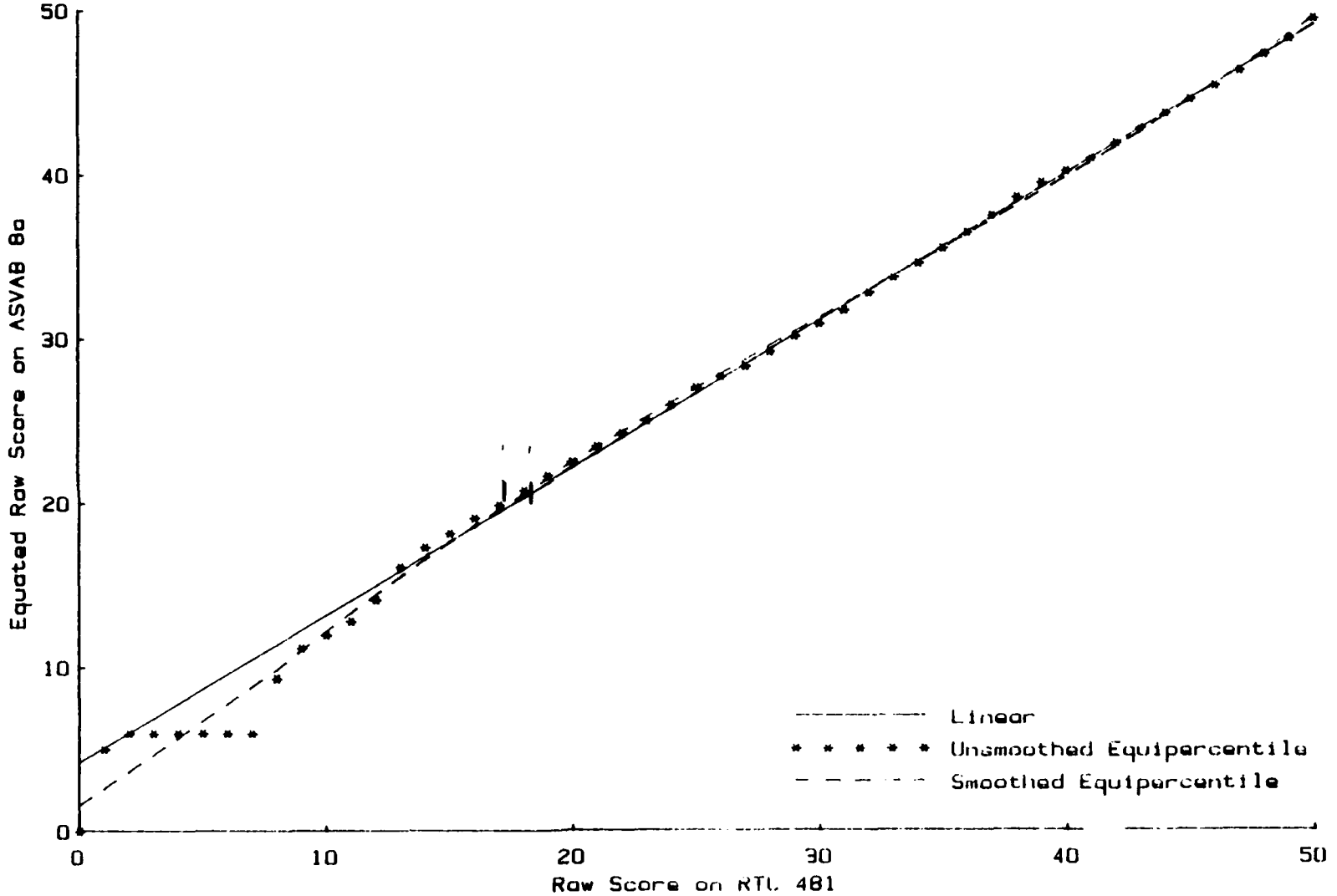

Figure A-47. Equating Transformations for Raw Verbal Composite Scores from RTC 481 (ASVAB 12b).

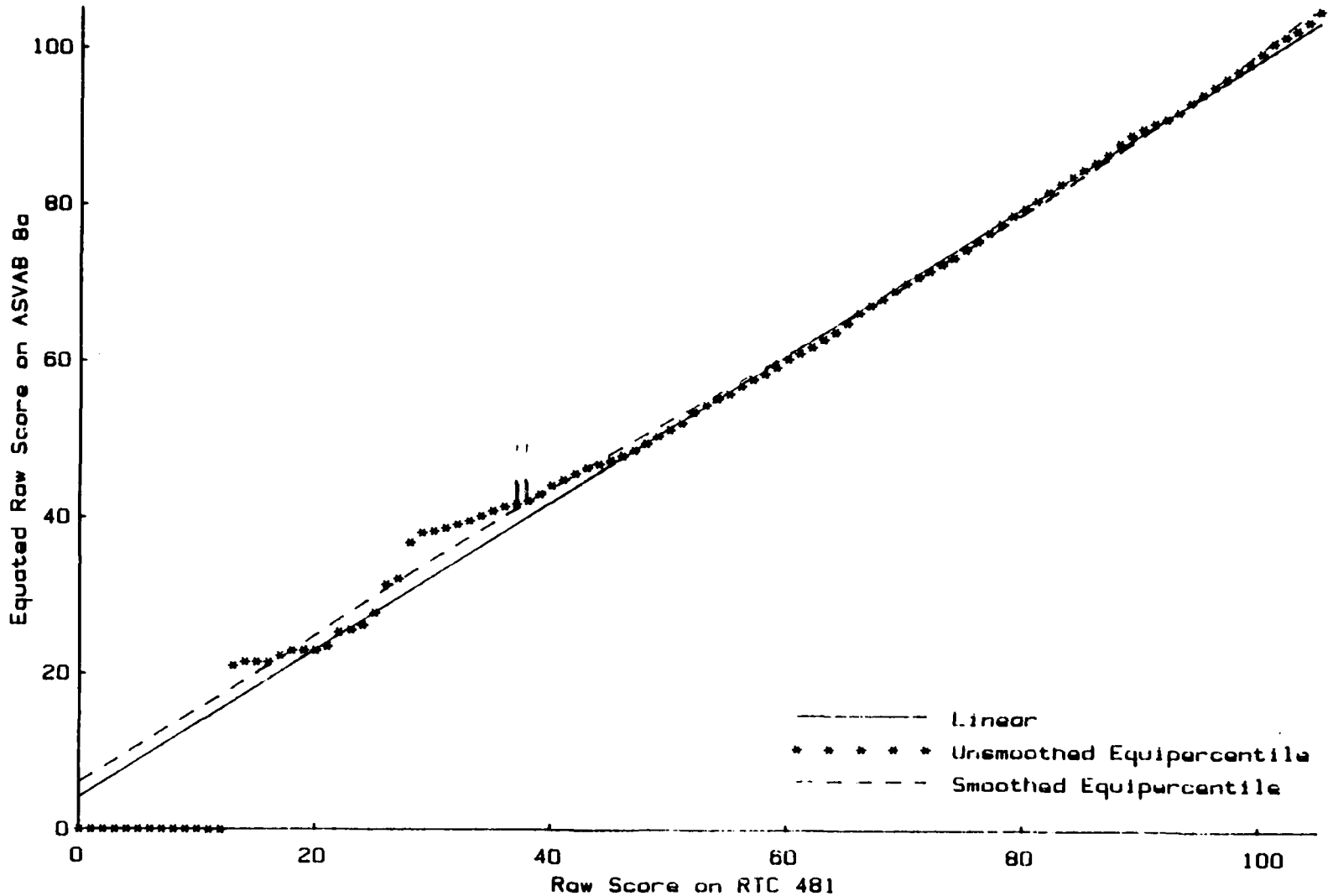

Figure A-48. Equating Transformations for Raw AFQT Composite Scores from RTC 481 (ASVAB 12b).

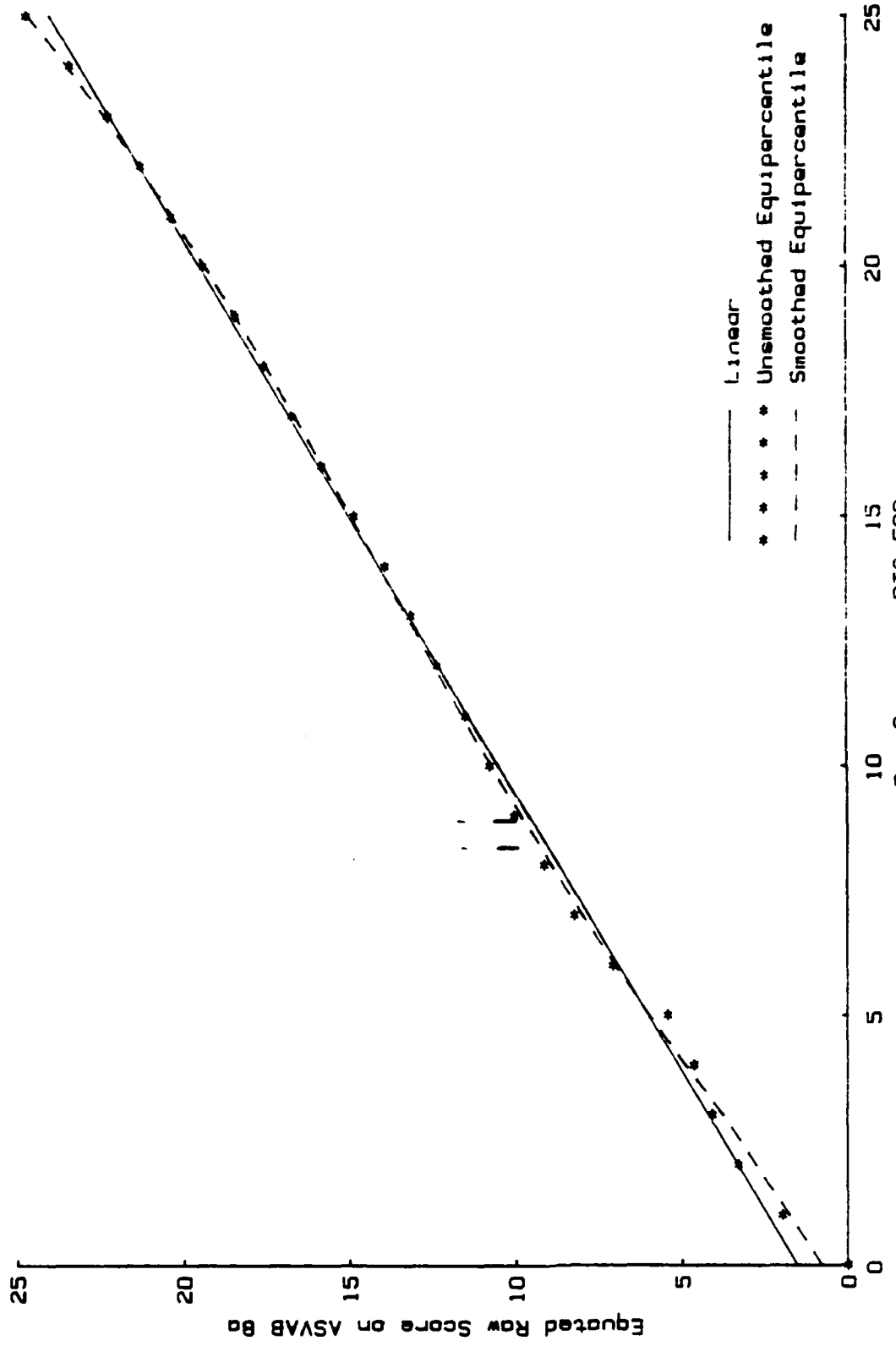

Figure A-49. Equating Transformations for Raw General Science Scores from RTC 592 (ASVAB 13a).

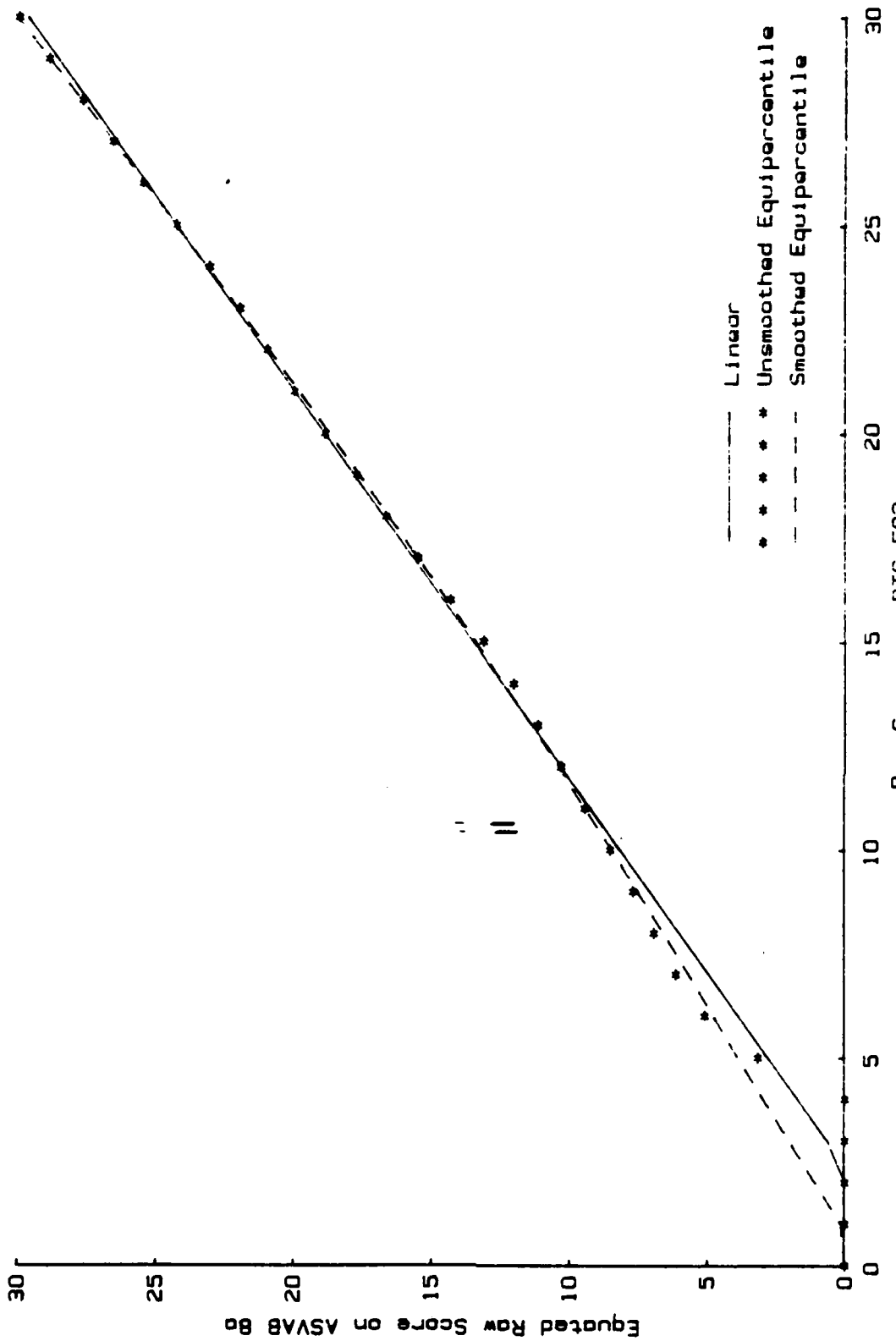

Figure A-50. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 592 (ASVAB 13a).

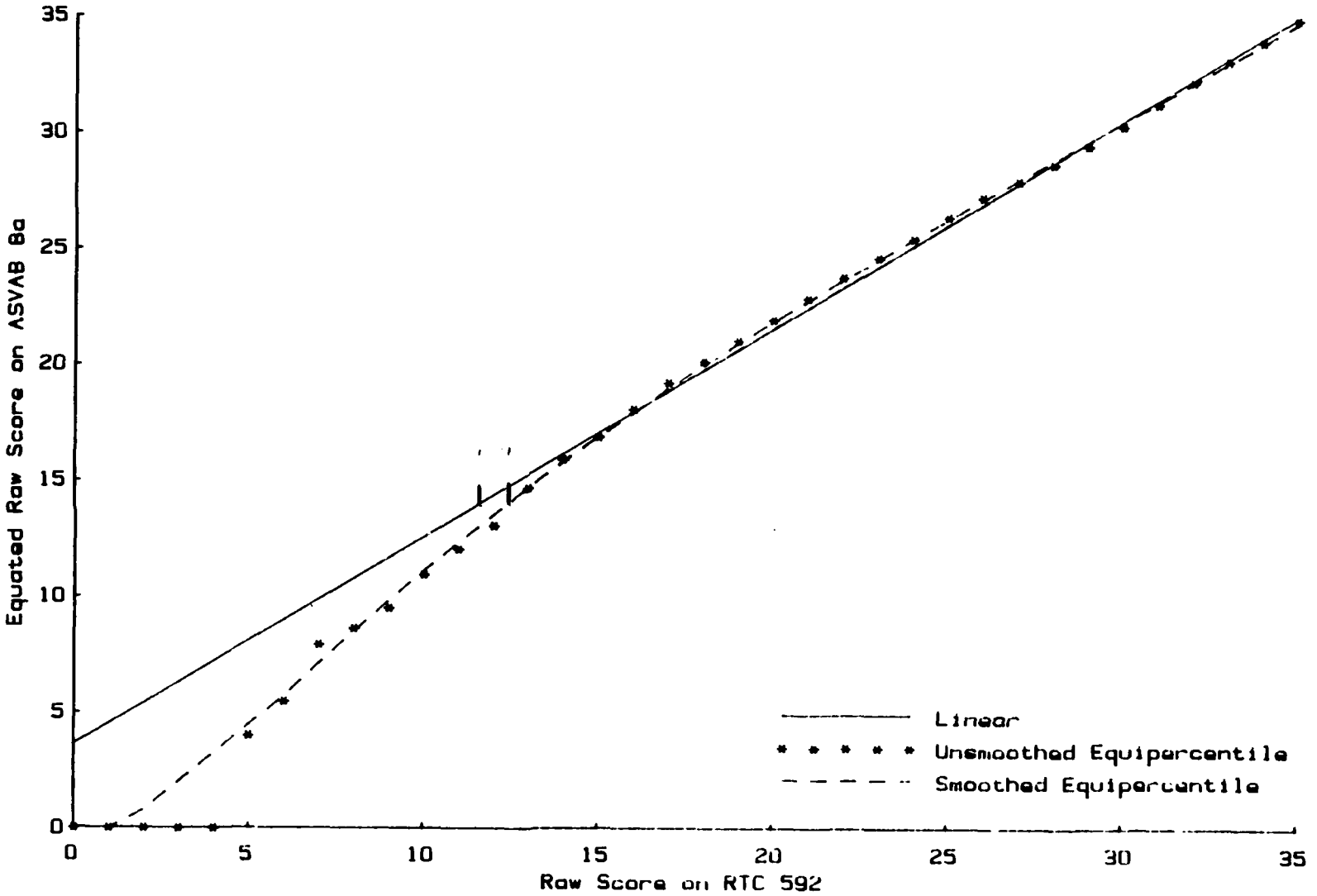

Figure A-51. Equating Transformations for Raw Word Knowledge Scores from RTC 592 (ASVAB 13a).

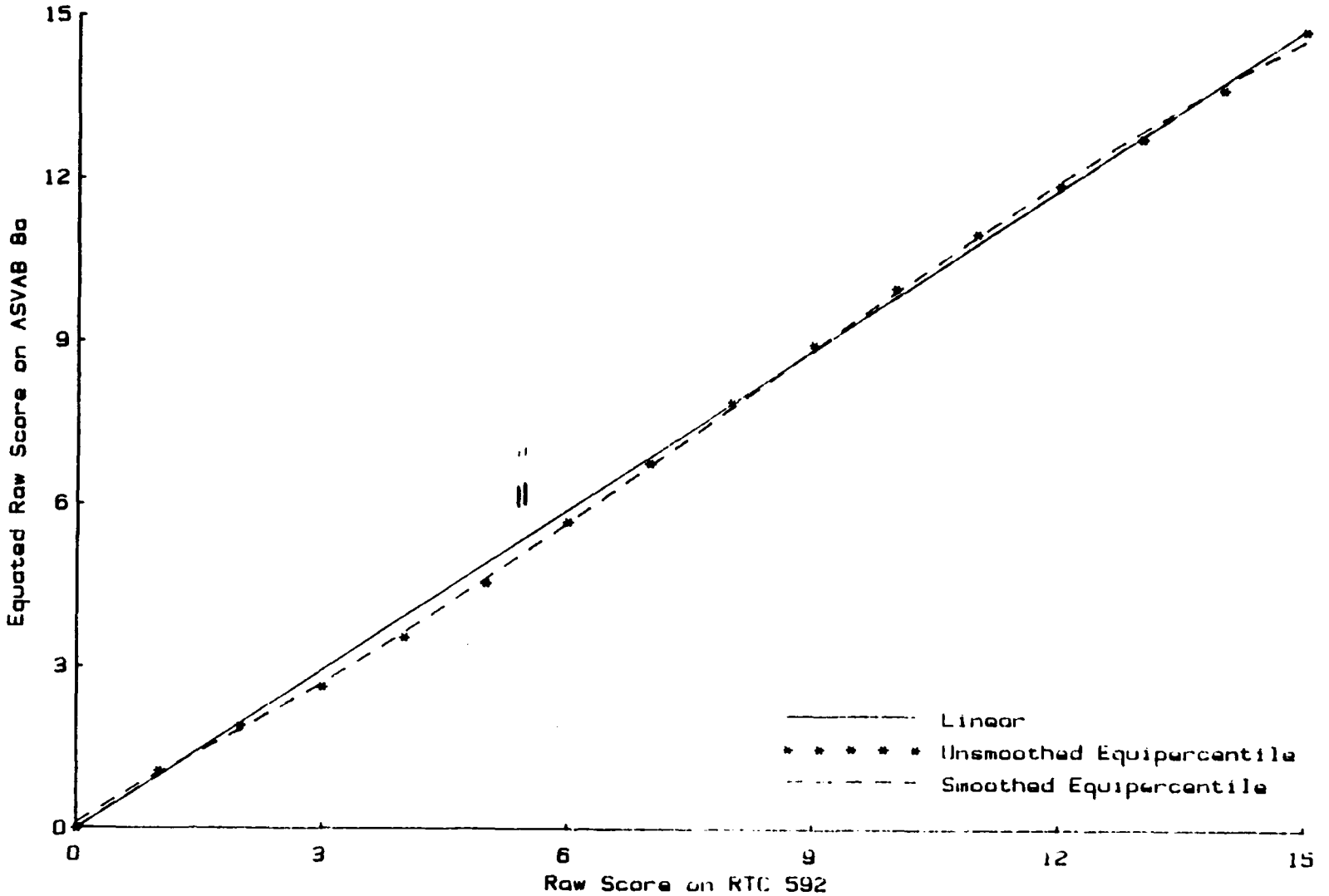

Figure A-52. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 592 (ASVAB 13a).

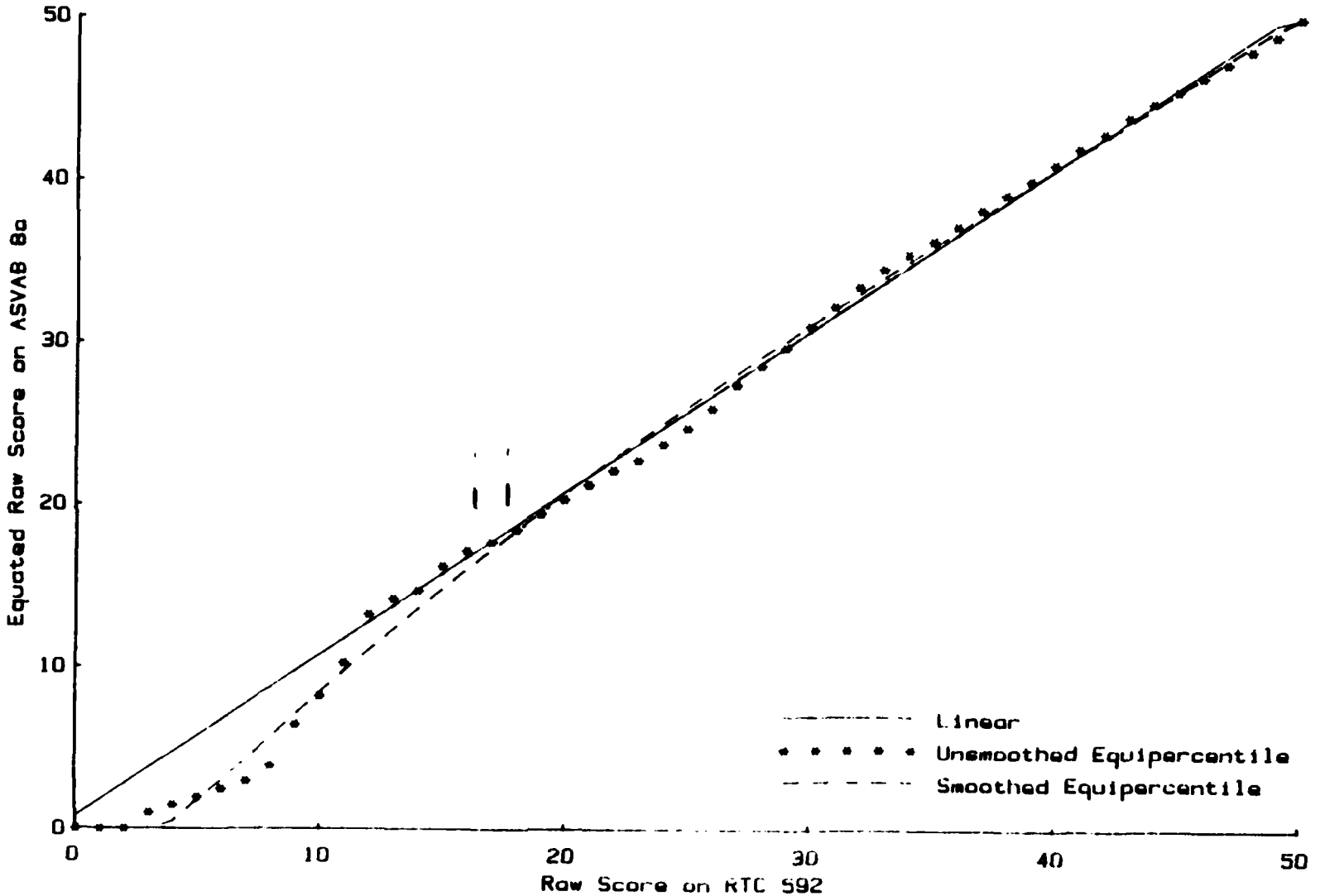

Figure A-53. Equating Transformations for Raw Numerical Operations Scores from RTC 592 (ASVAB 13a).

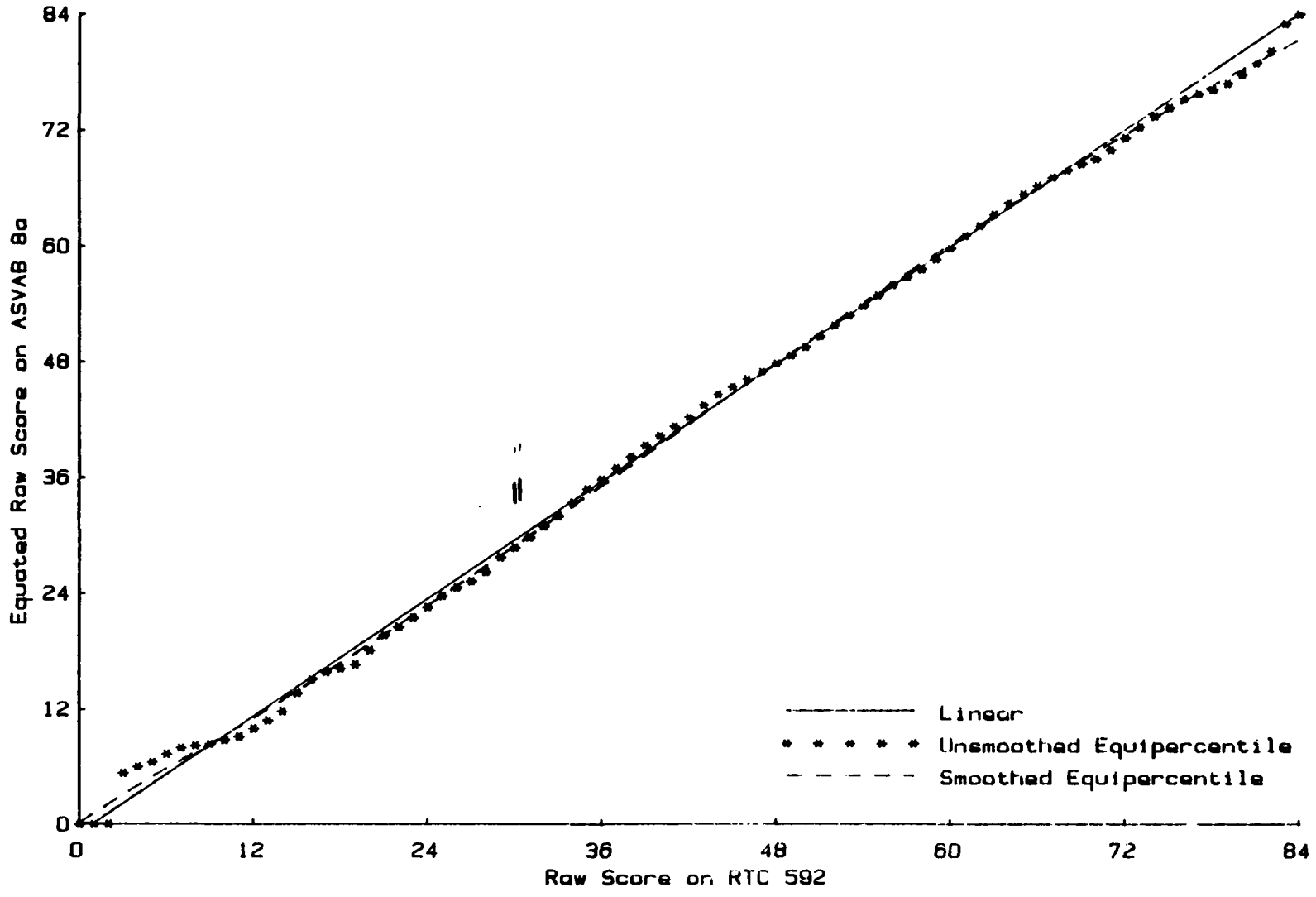

Figure A-54. Equating Transformations for Raw Coding Speed Scores from RTC 592 (ASVAB 13a).

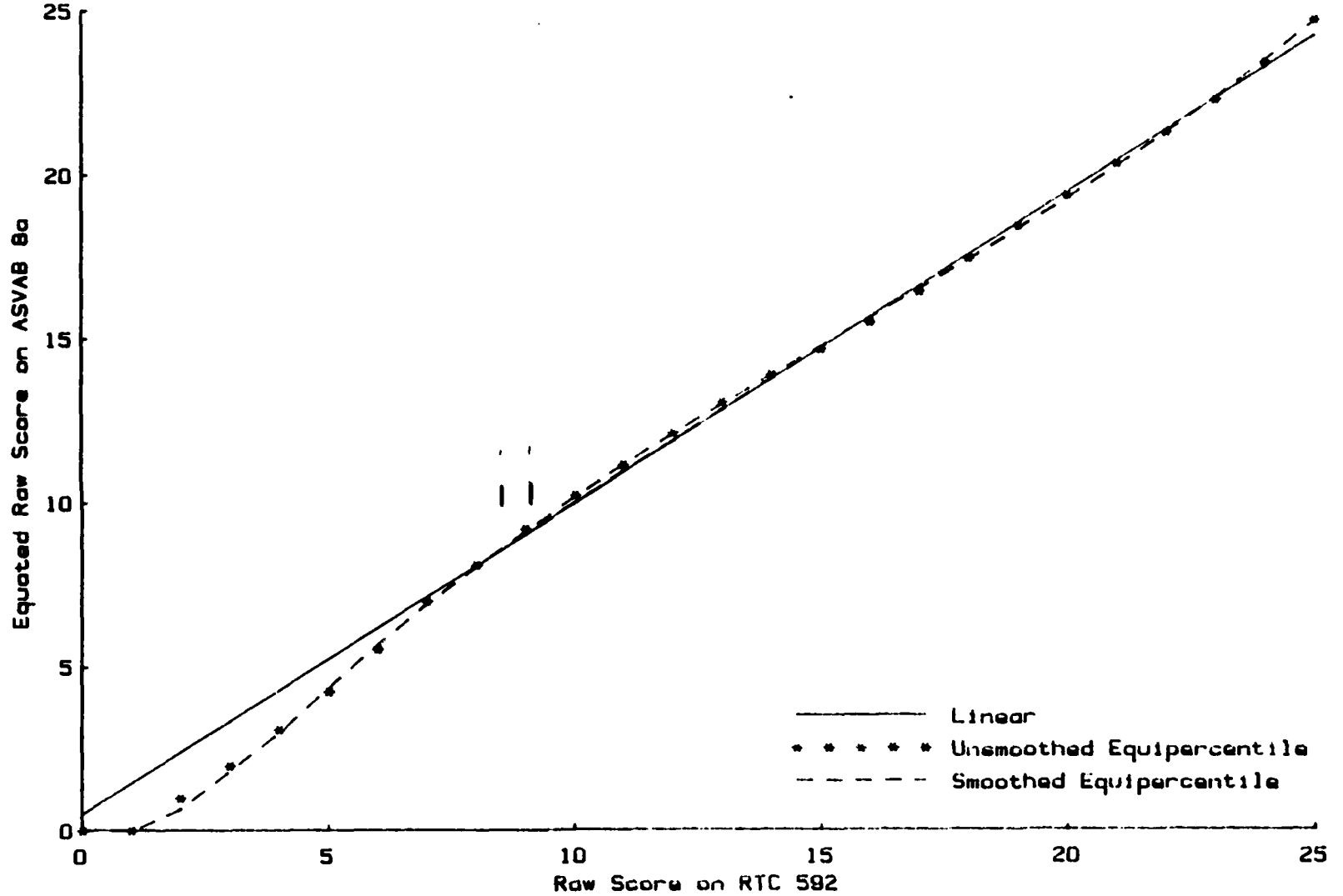

Figure A-55. Equating Transformations for Raw Auto & Shop Information Scores from RTC 592 (ASVAB 13a).

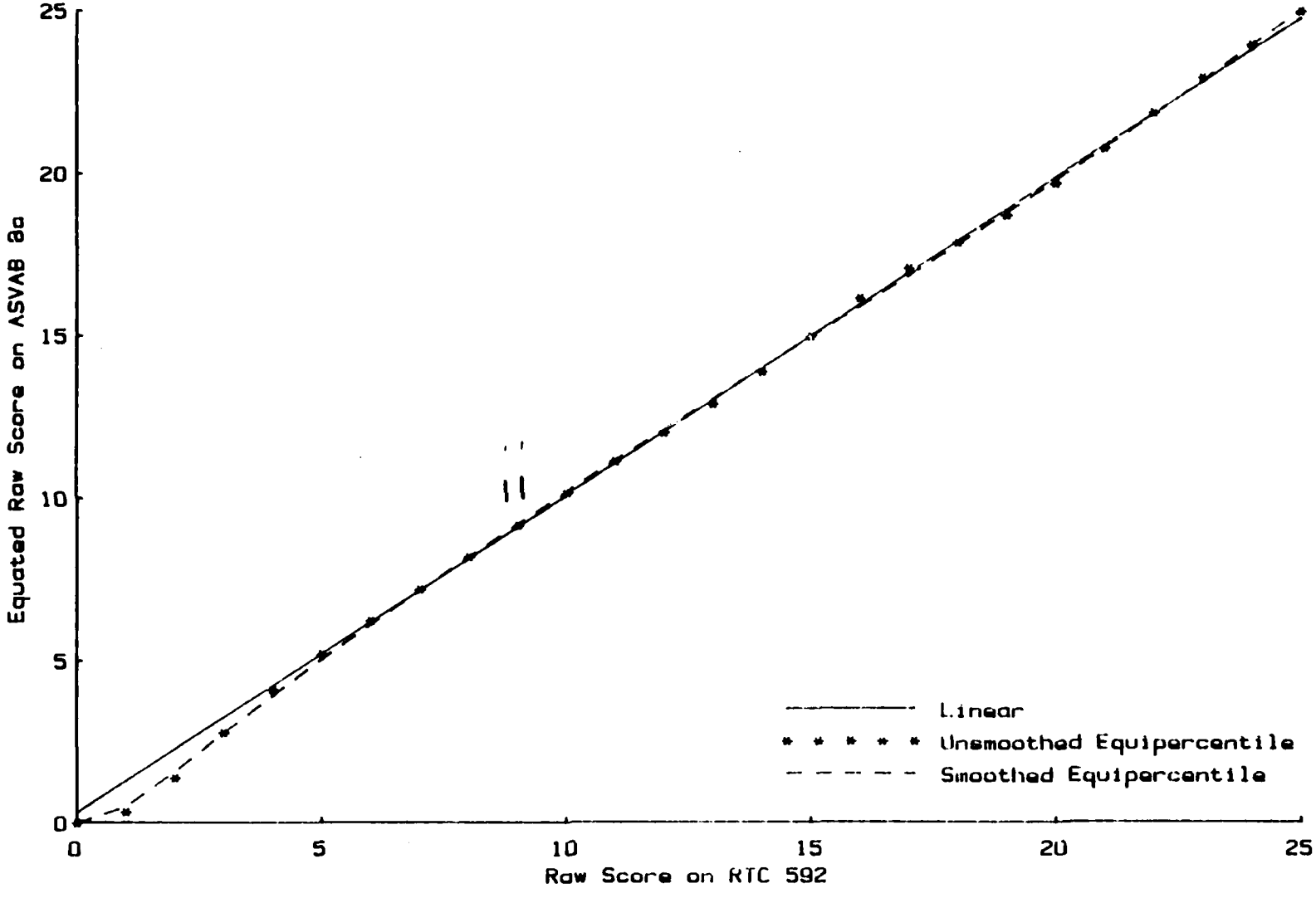

Figure A-56. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 592 (ASVAB 13a).

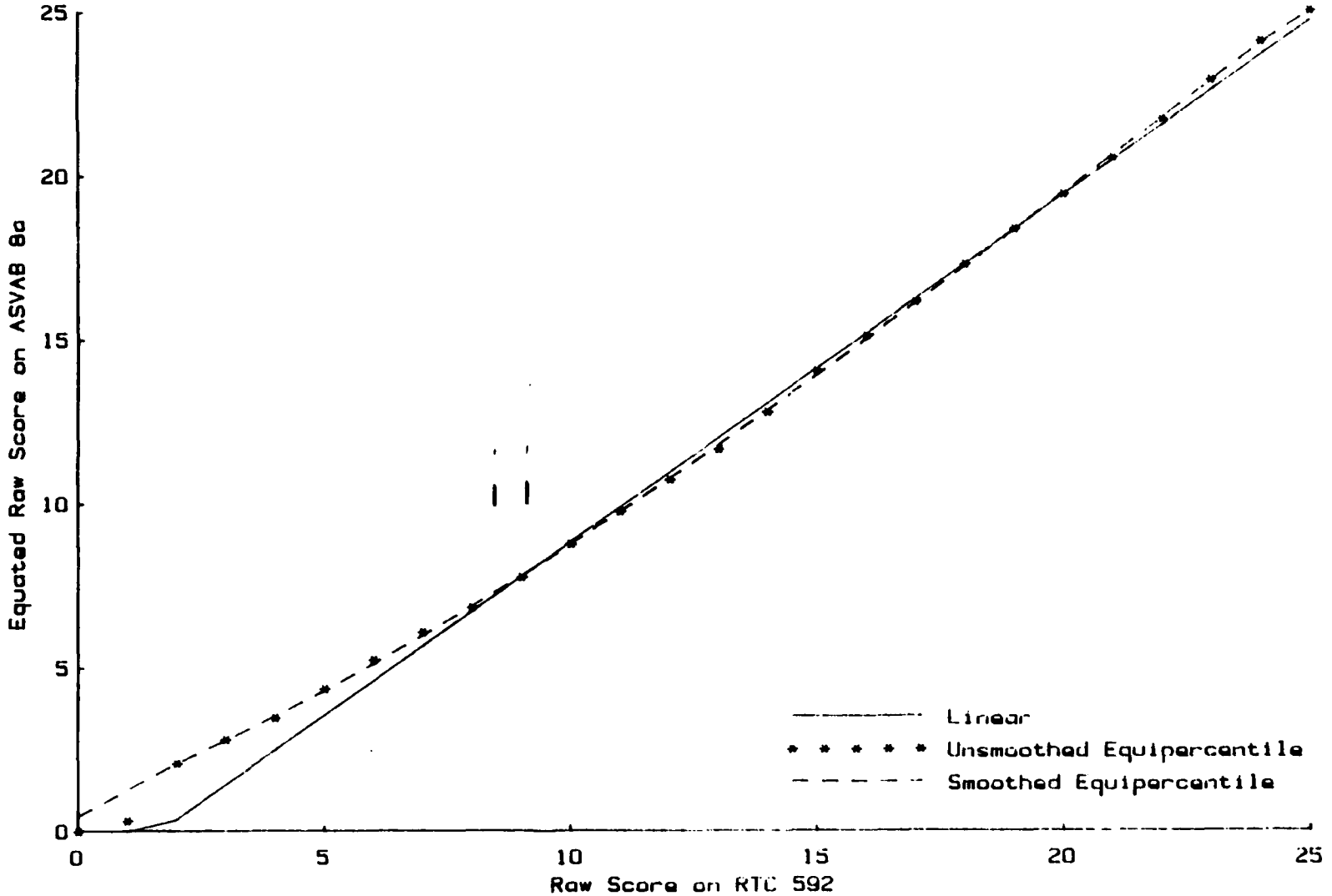

Figure A-57. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 592 (ASVAB 13a).

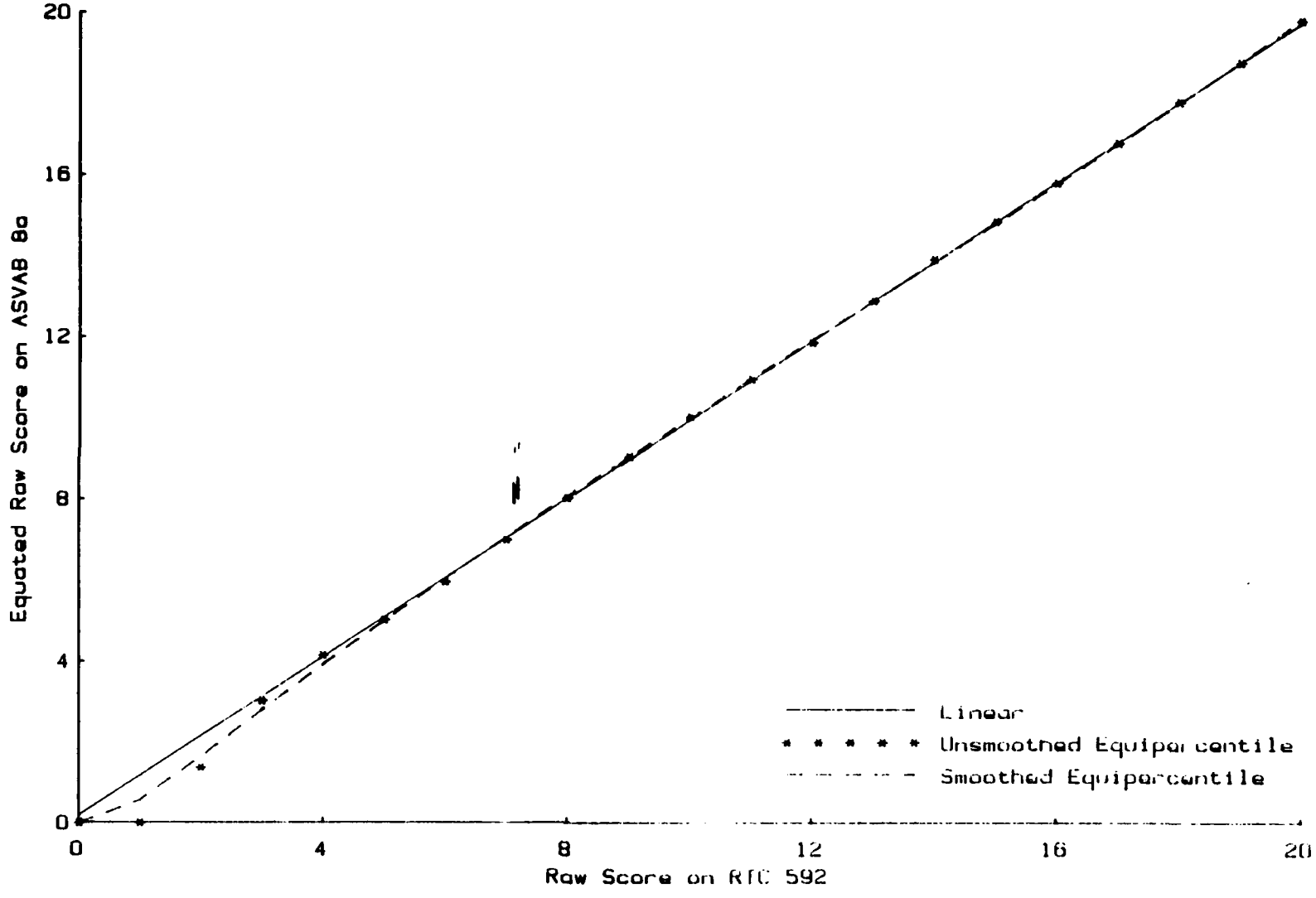

Figure A-58. Equating Transformations for Raw Electronics Information Scores from RTC 592 (ASVAB 13a).

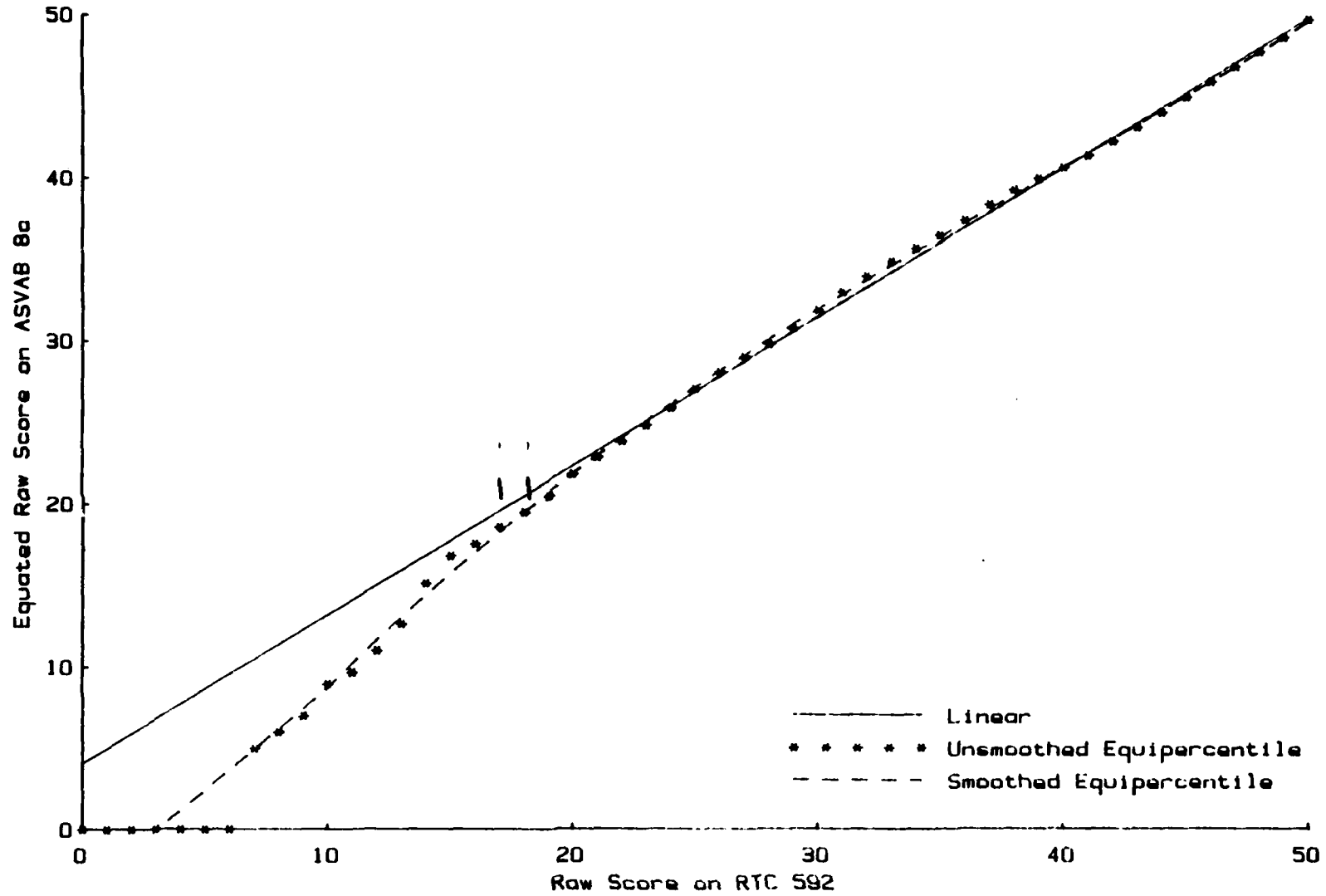

Figure A-59. Equating Transformations for Raw Verbal Composite Scores from RTC 592 (ASVAB 13a).

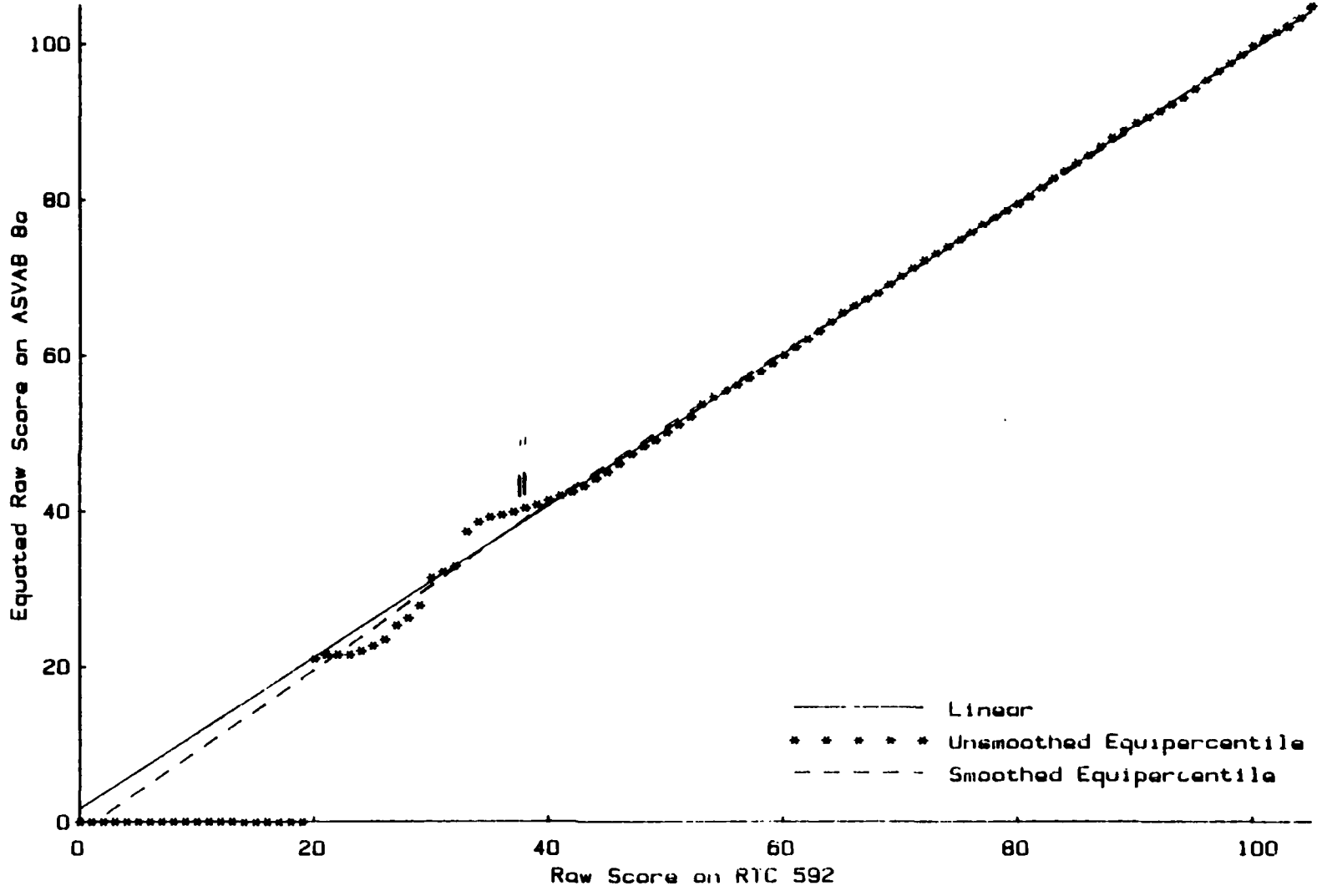

Figure A-60. Equating Transformations for Raw AFQT Composite Scores from RTC 592 (ASVAB 13a).

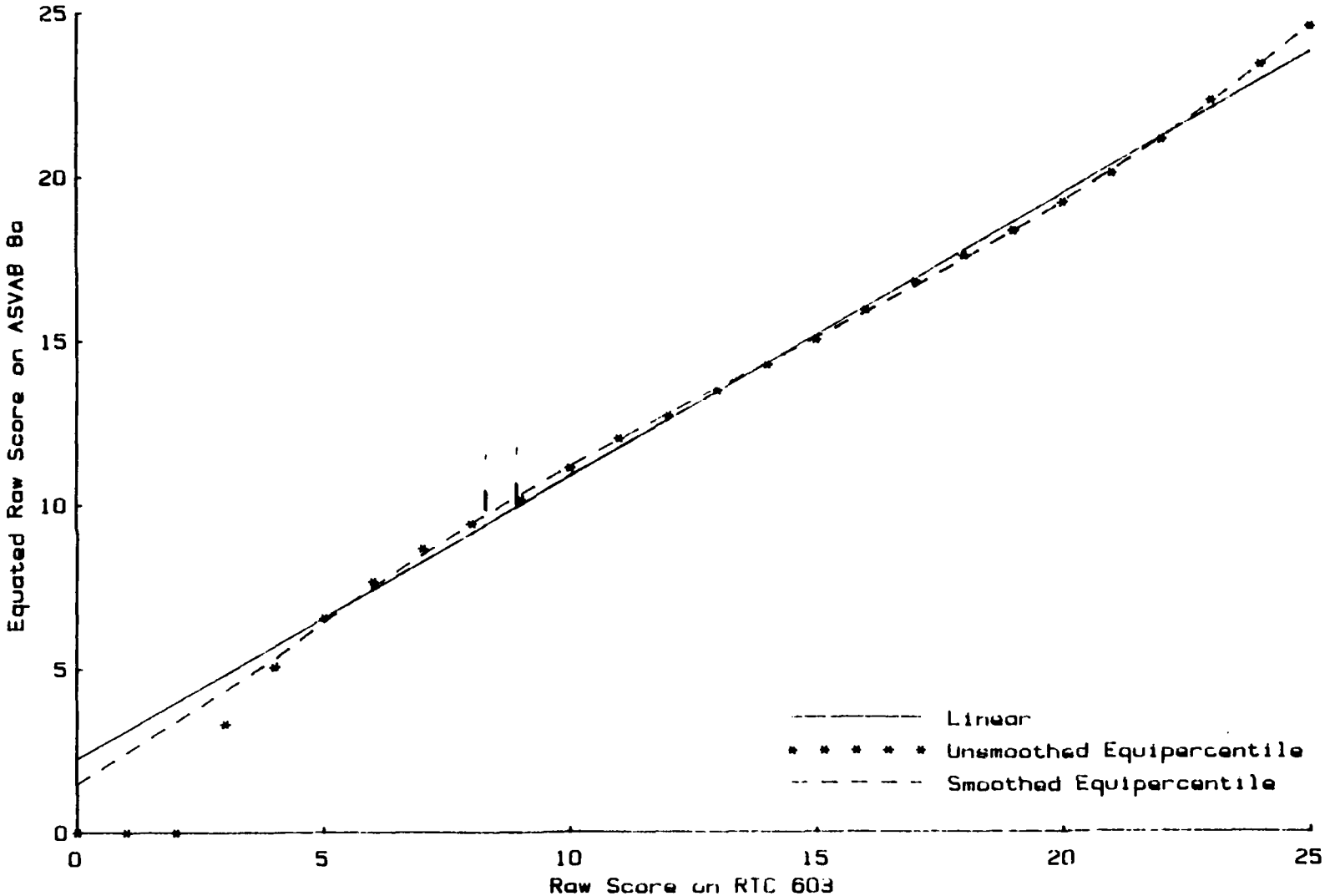

Figure A-61. Equating Transformations for Raw General Science Scores from RTC 603 (ASVAB 13b).

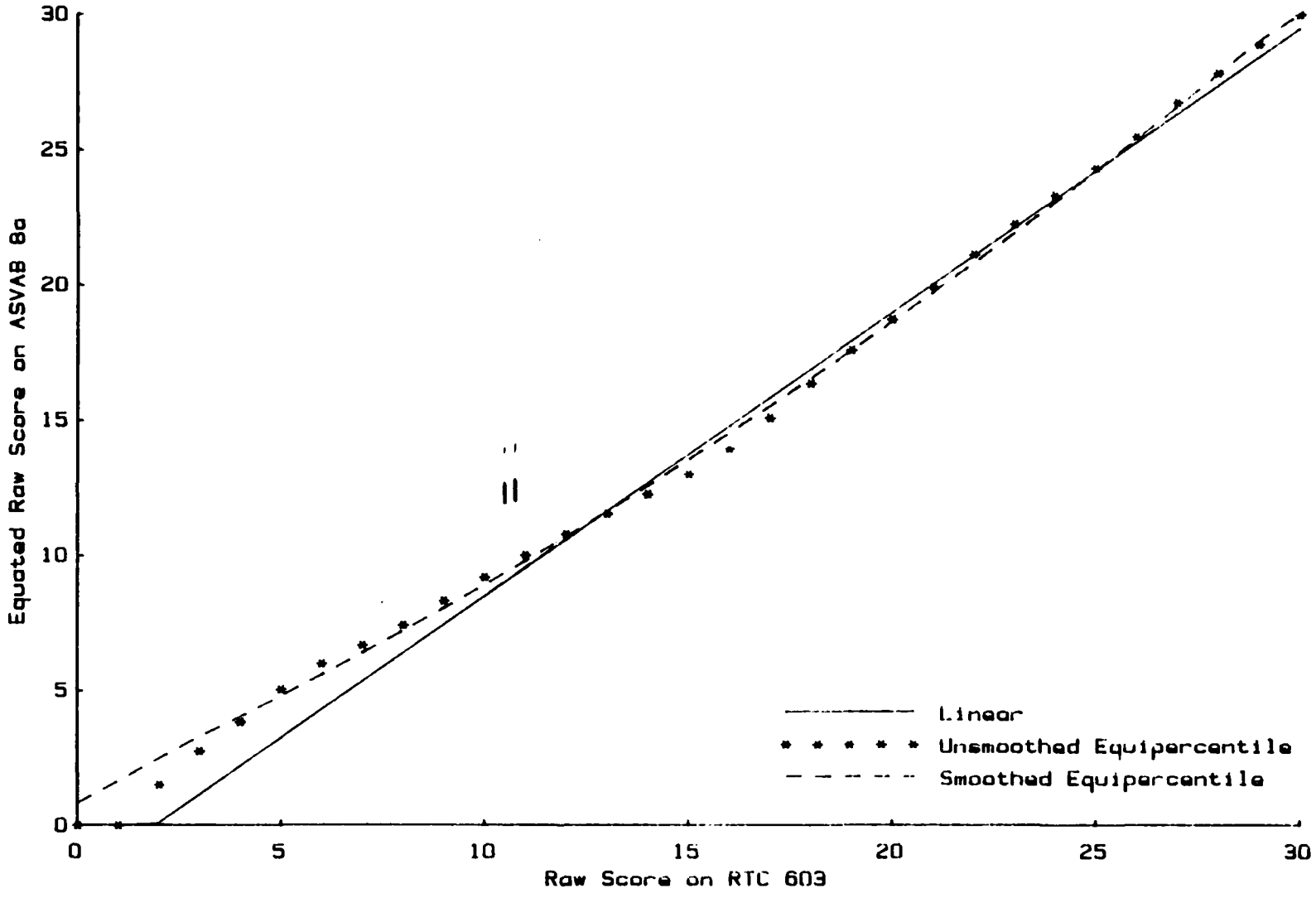

Figure A-62. Equating Transformations for Raw Arithmetic Reasoning Scores from RTC 603 (ASVAB 13b).

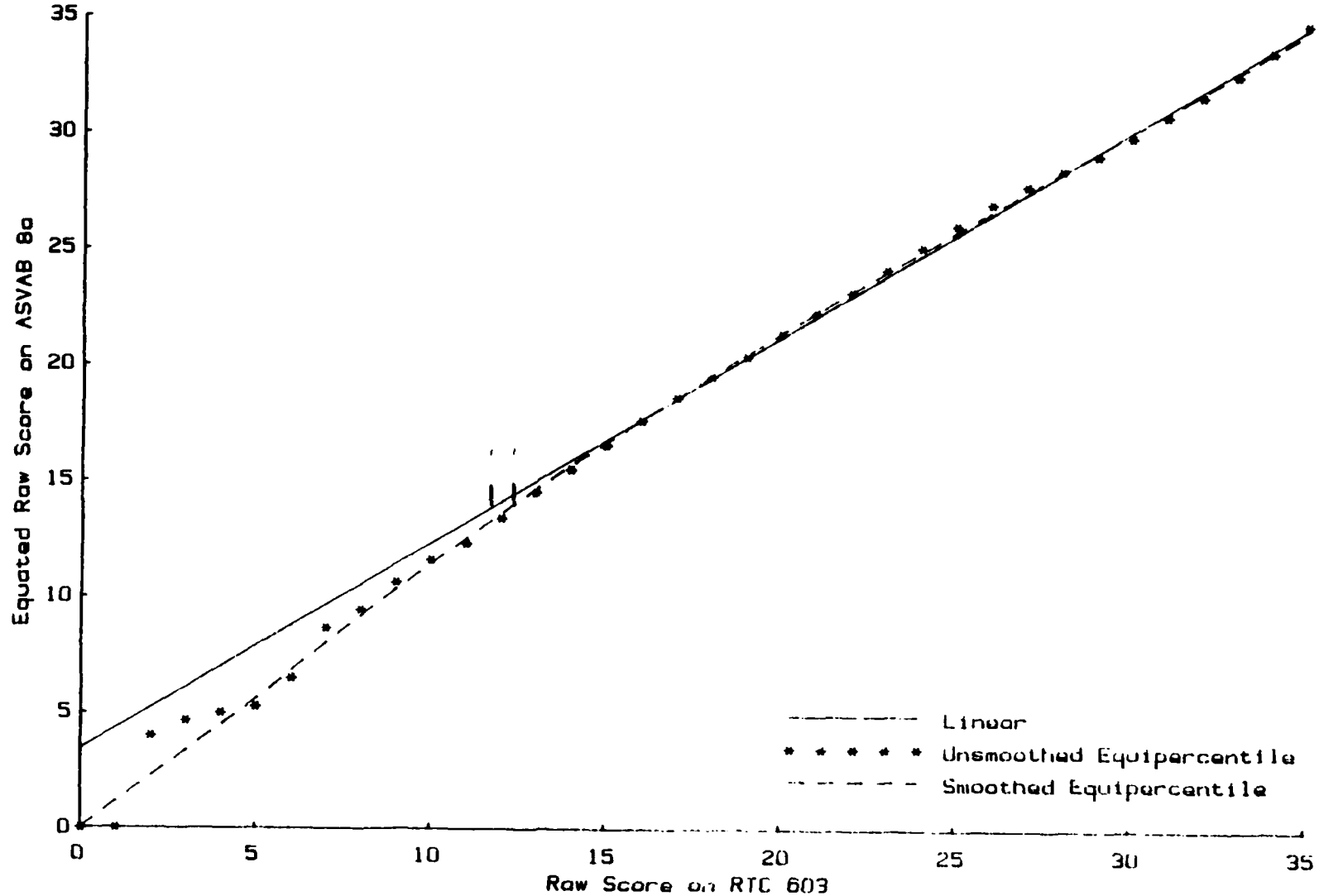

Figure A-63. Equating Transformations for Raw Word Knowledge Scores from RTC 603 (ASVAB 13b).

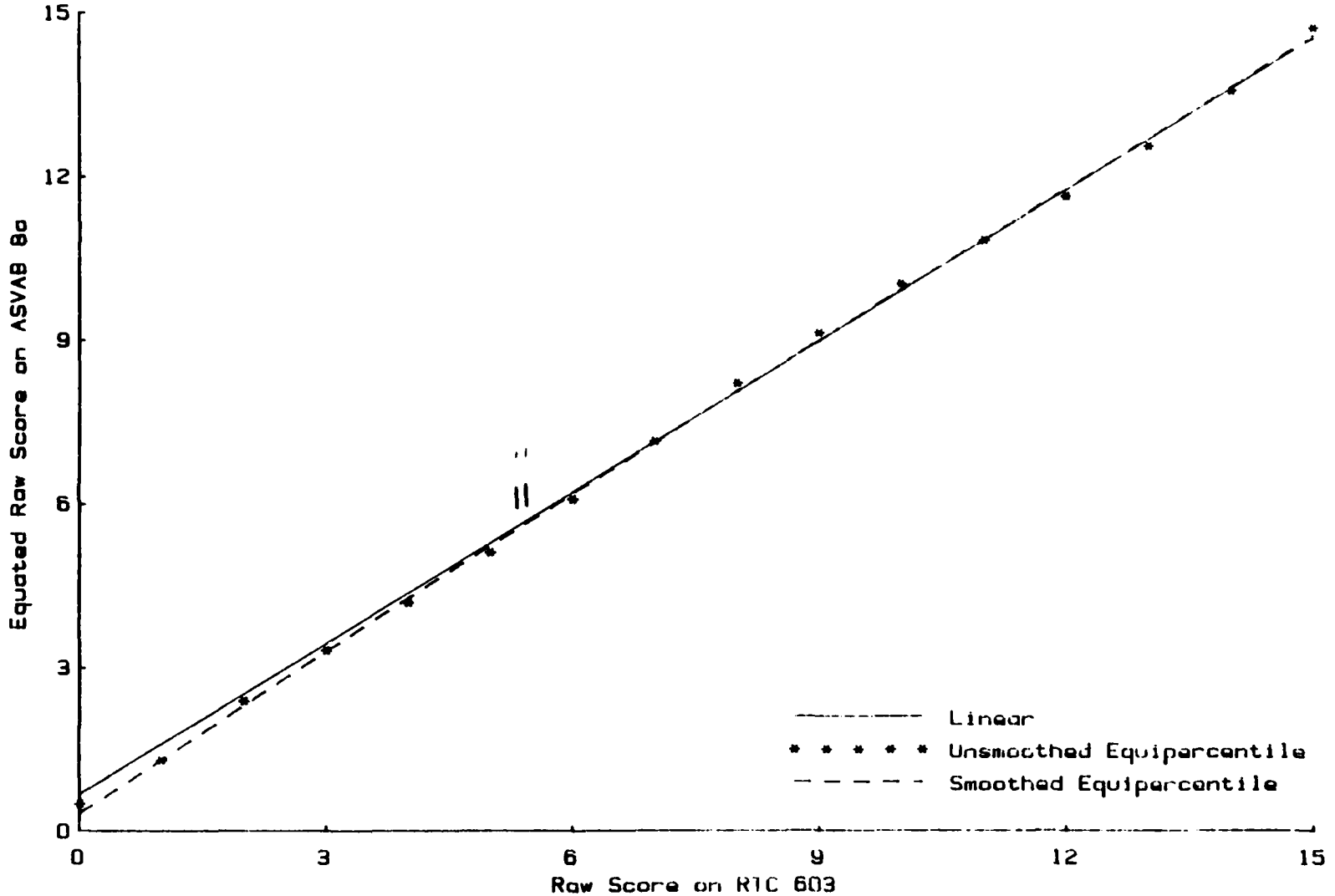

Figure A-64. Equating Transformations for Raw Paragraph Comprehension Scores from RTC 603 (ASVAB 13b).

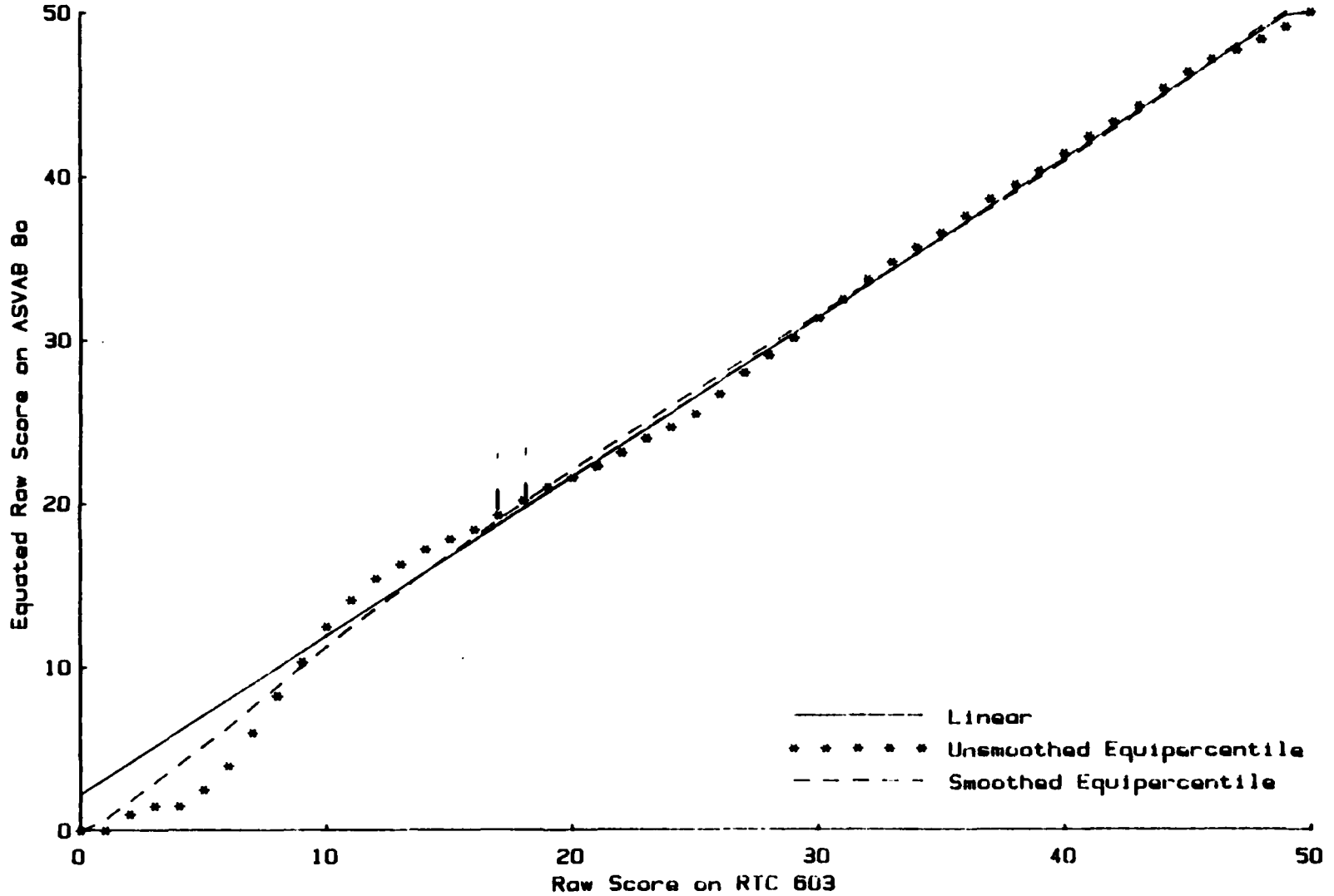

Figure A-65. Equating Transformations for Raw Numerical Operations Scores from RTC 603 (ASVAB 13b).

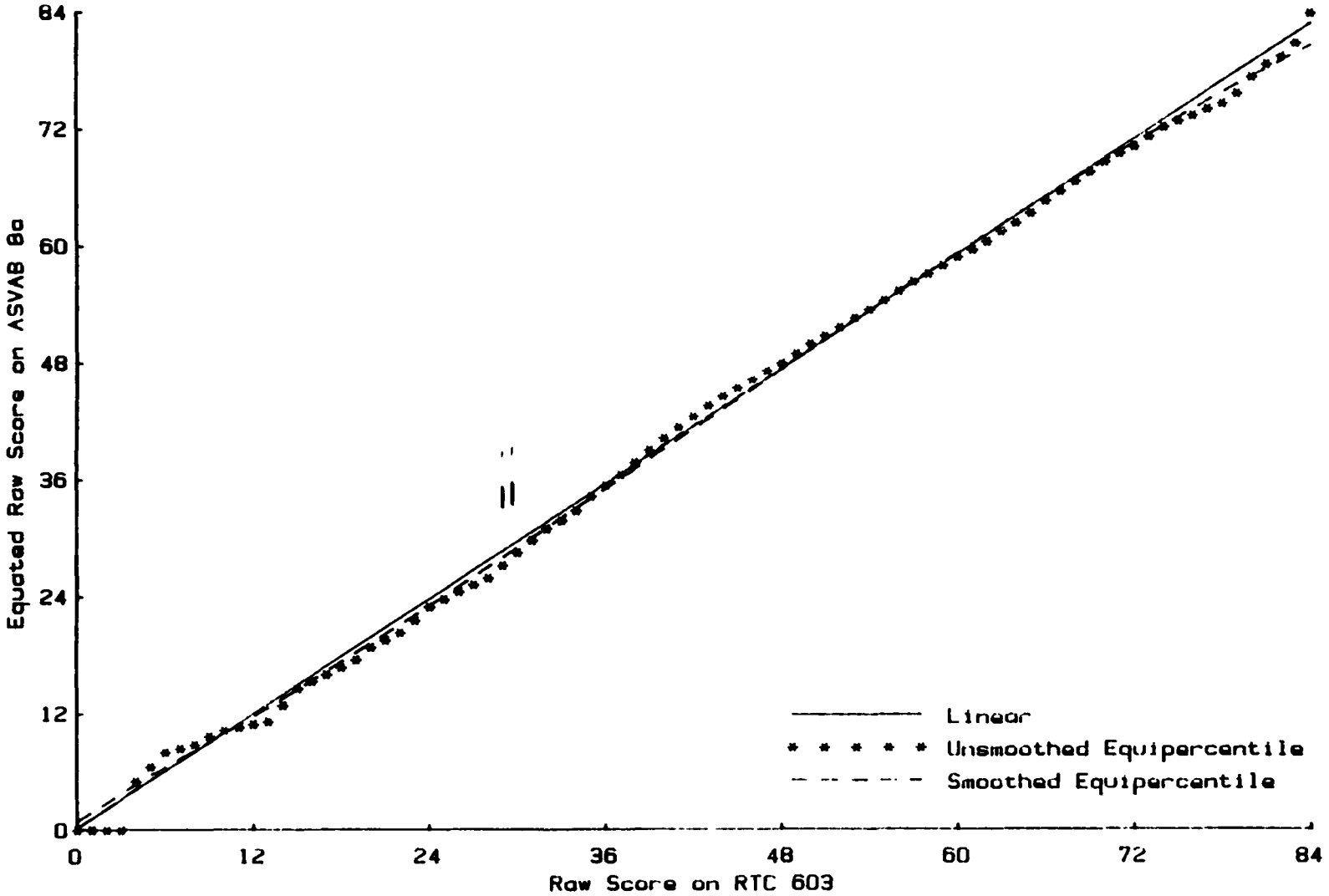

Figure A-66. Equating Transformations for Raw Coding Speed Scores from RTC 603 (ASVAB 13b).

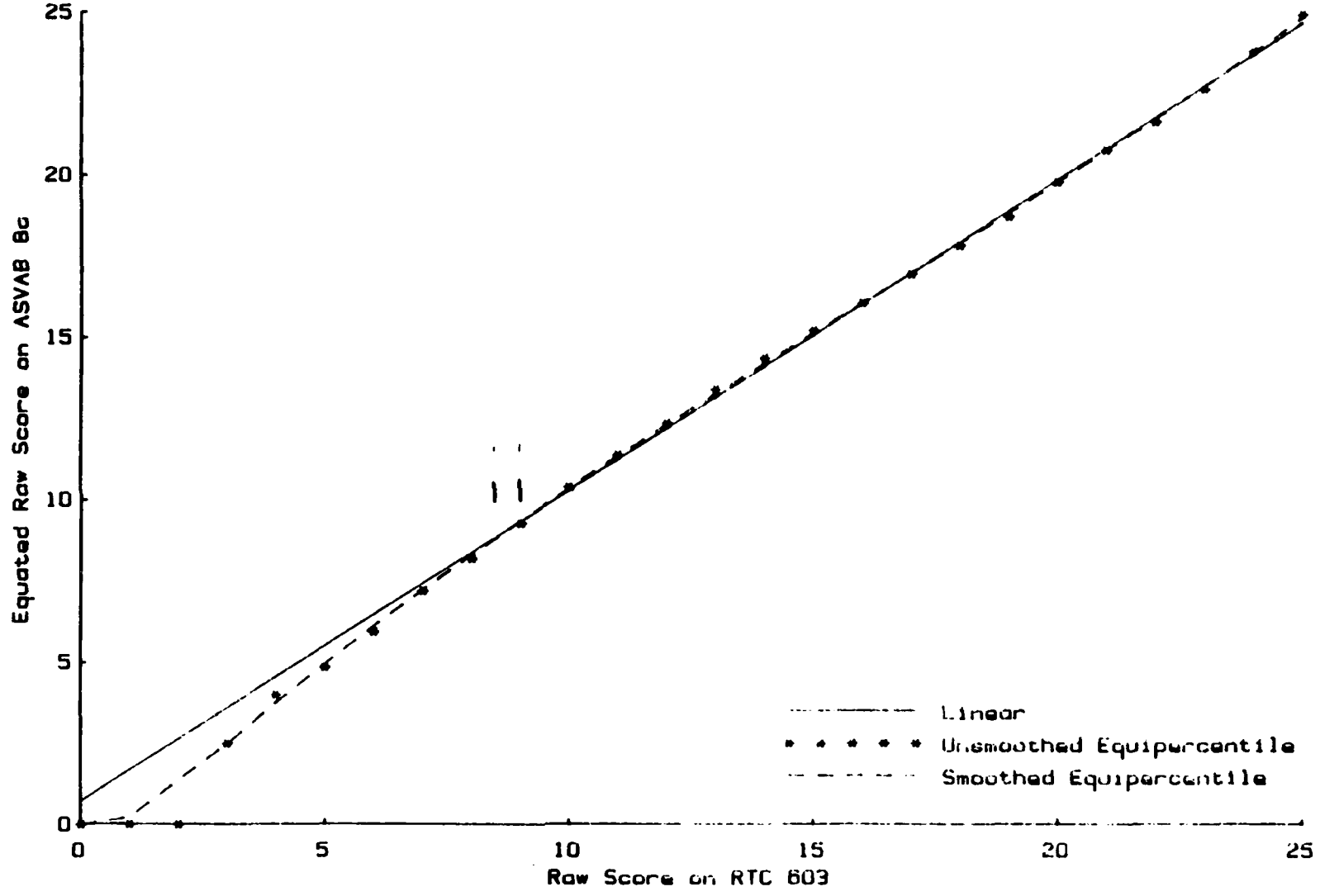

Figure A-67. Equating Transformations for Raw Auto & Shop Information Scores from RTC 603 (ASVAB 13b).

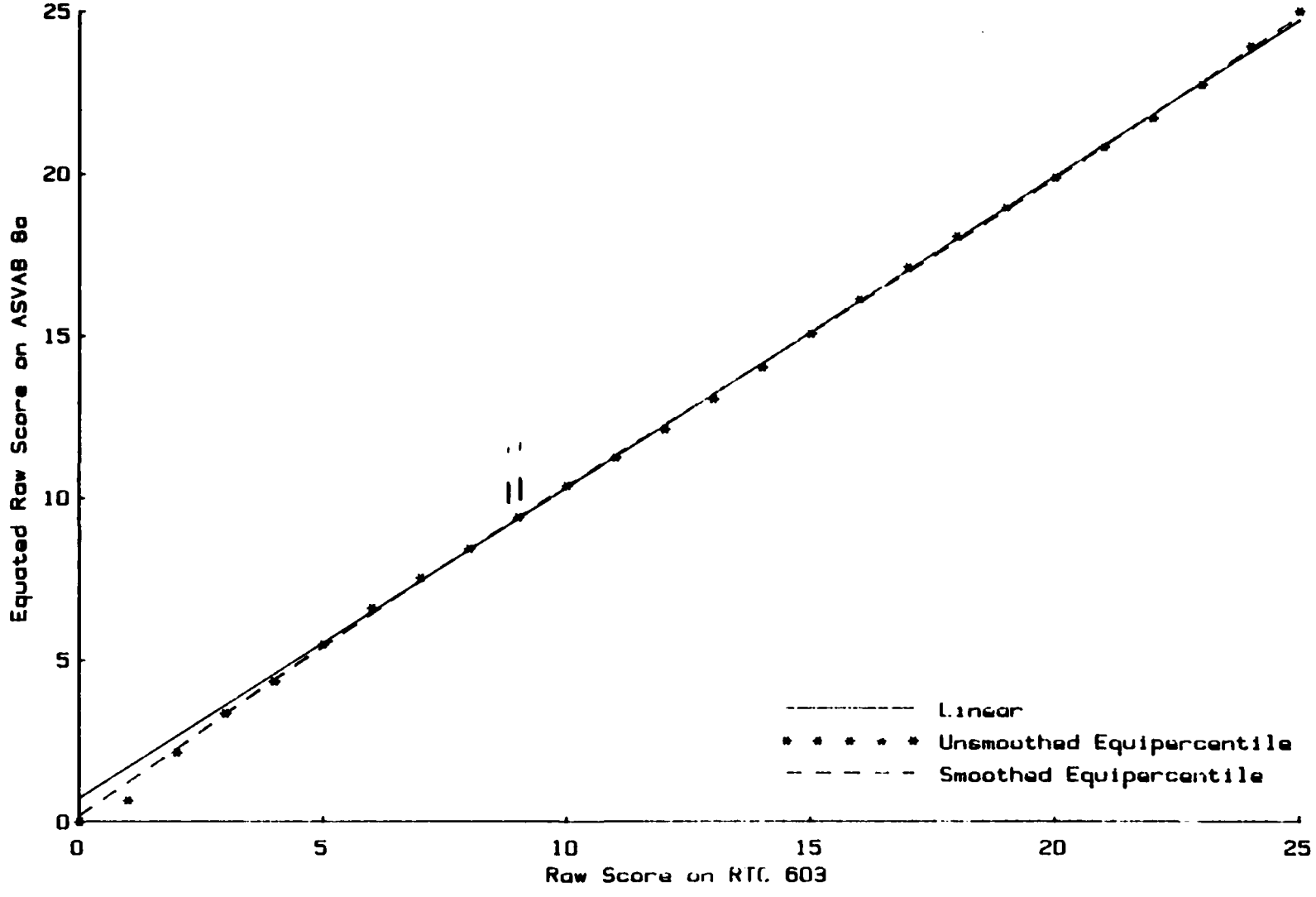

Figure A-68. Equating Transformations for Raw Mathematics Knowledge Scores from RTC 603 (ASVAB 13b).

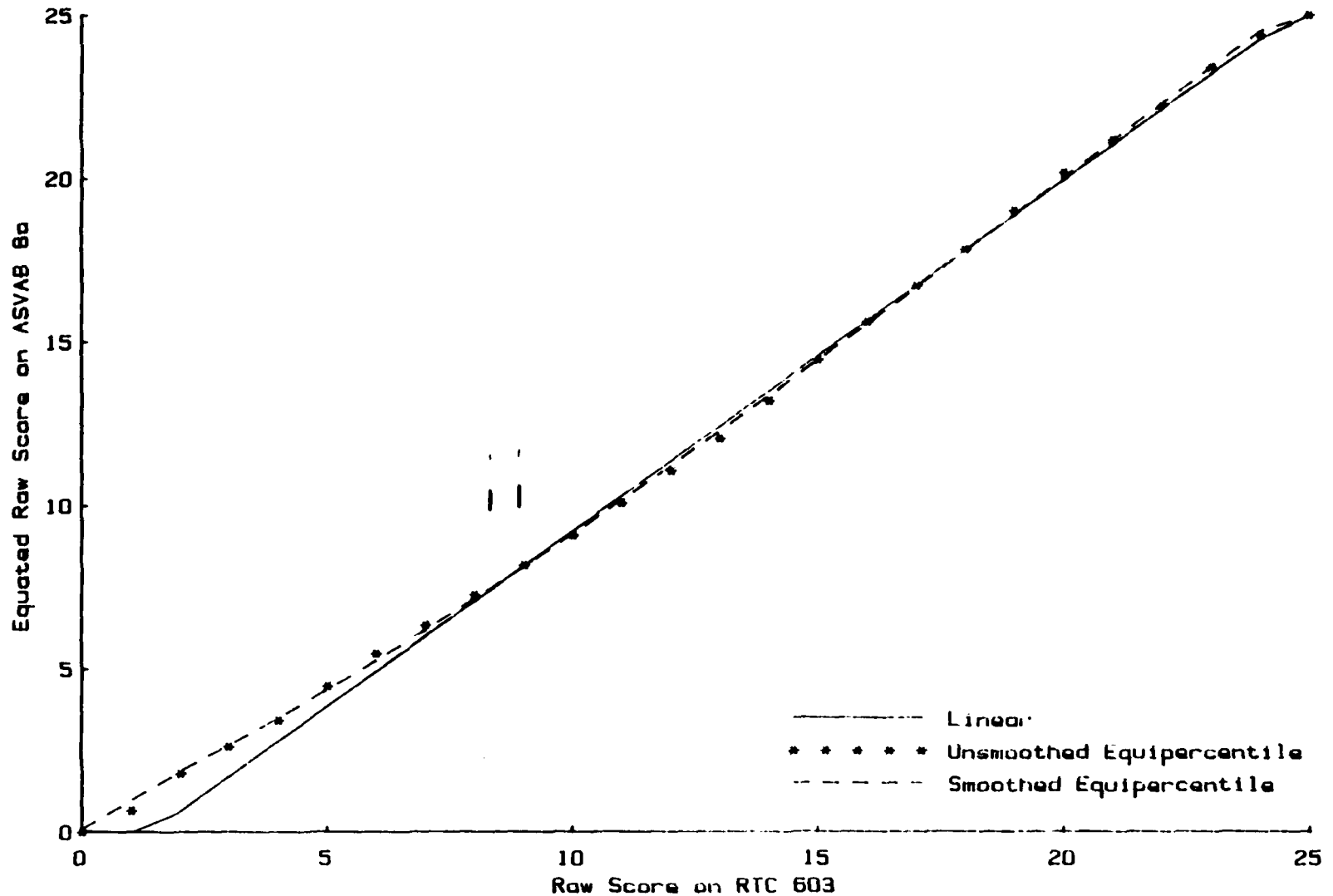

Figure A-69. Equating Transformations for Raw Mechanical Comprehension Scores from RTC 603 (ASVAB 13b).

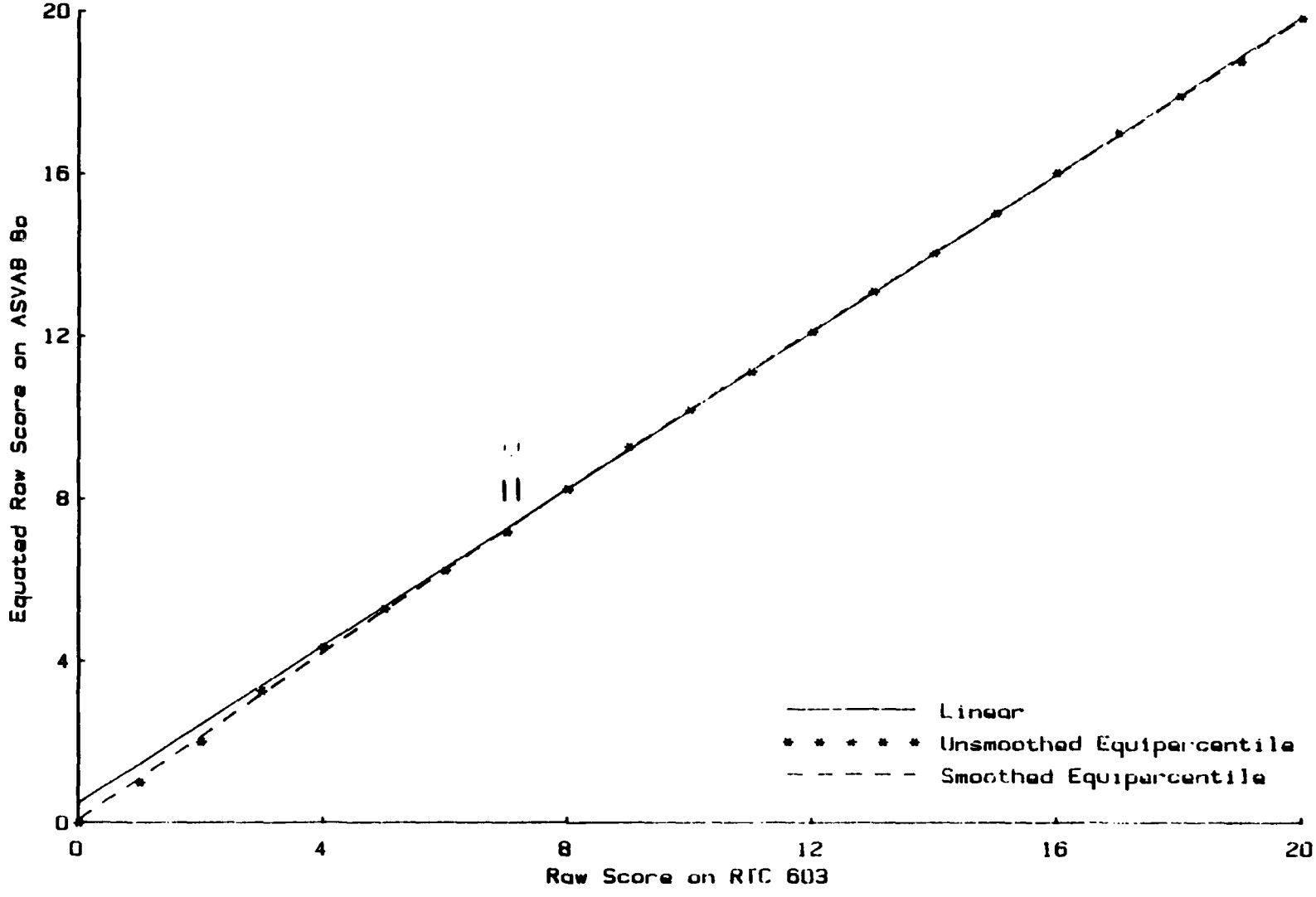

Figure A-70. Equating Transformations for Raw Electronics Information Scores from RTC 603 (ASVAB 13b).

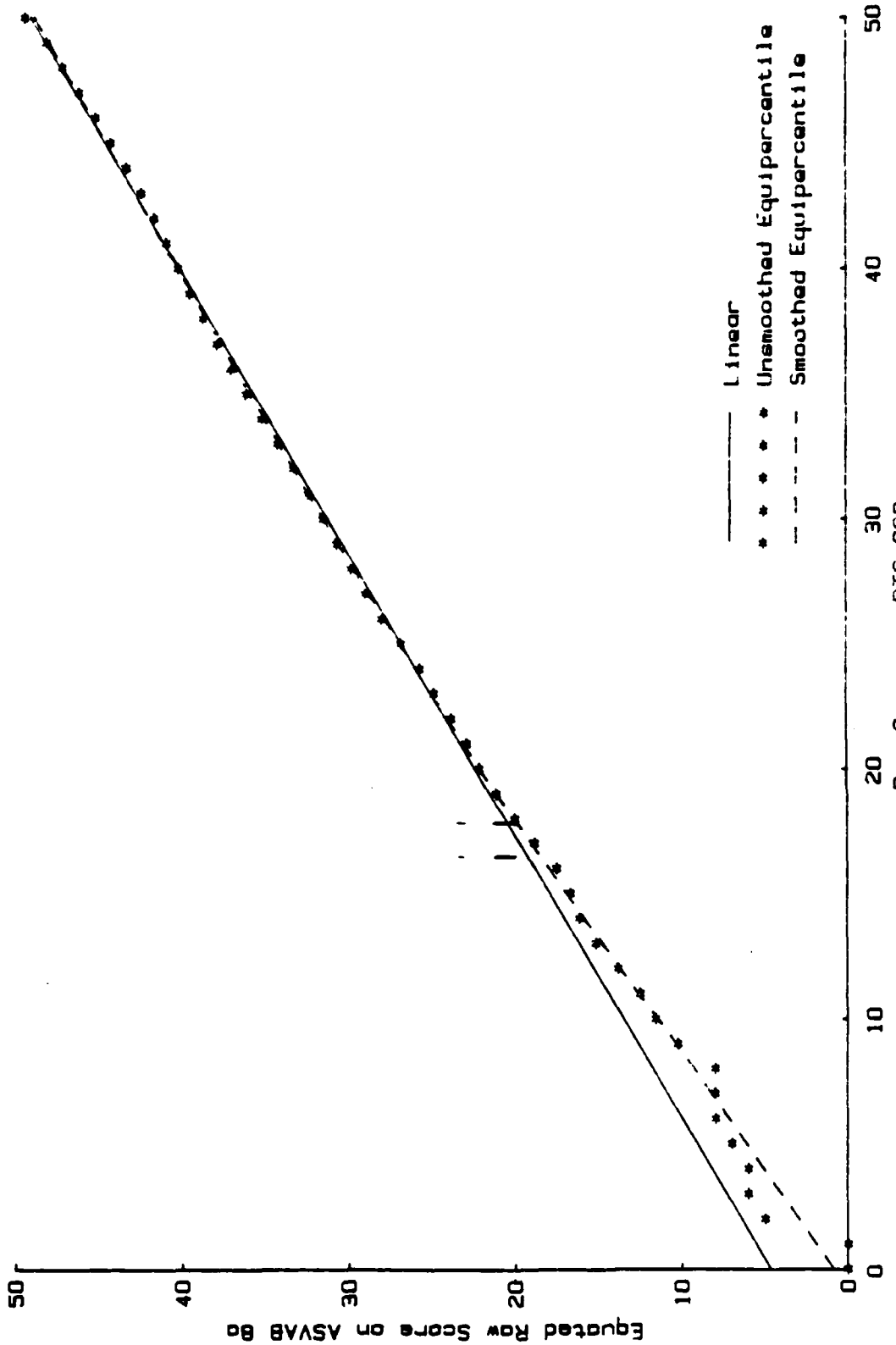

Figure A-71. Equating Transformations for Raw Verbal Composite Scores from RTC 603 (ASVAB 13b).

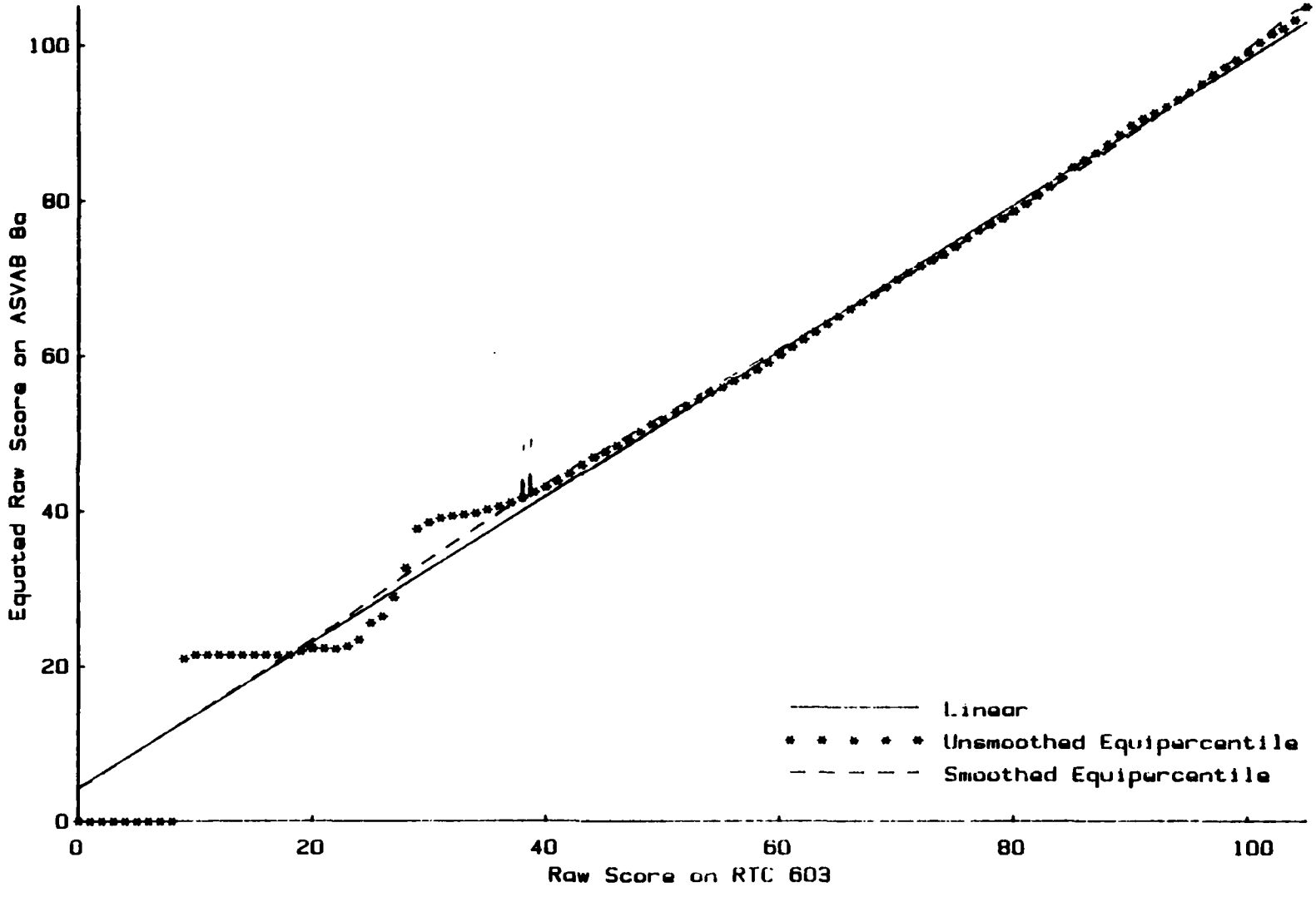

Figure A-72. Equating Transformations for Raw AFQT Composite Scores from RTC 603 (ASVAB 13b).

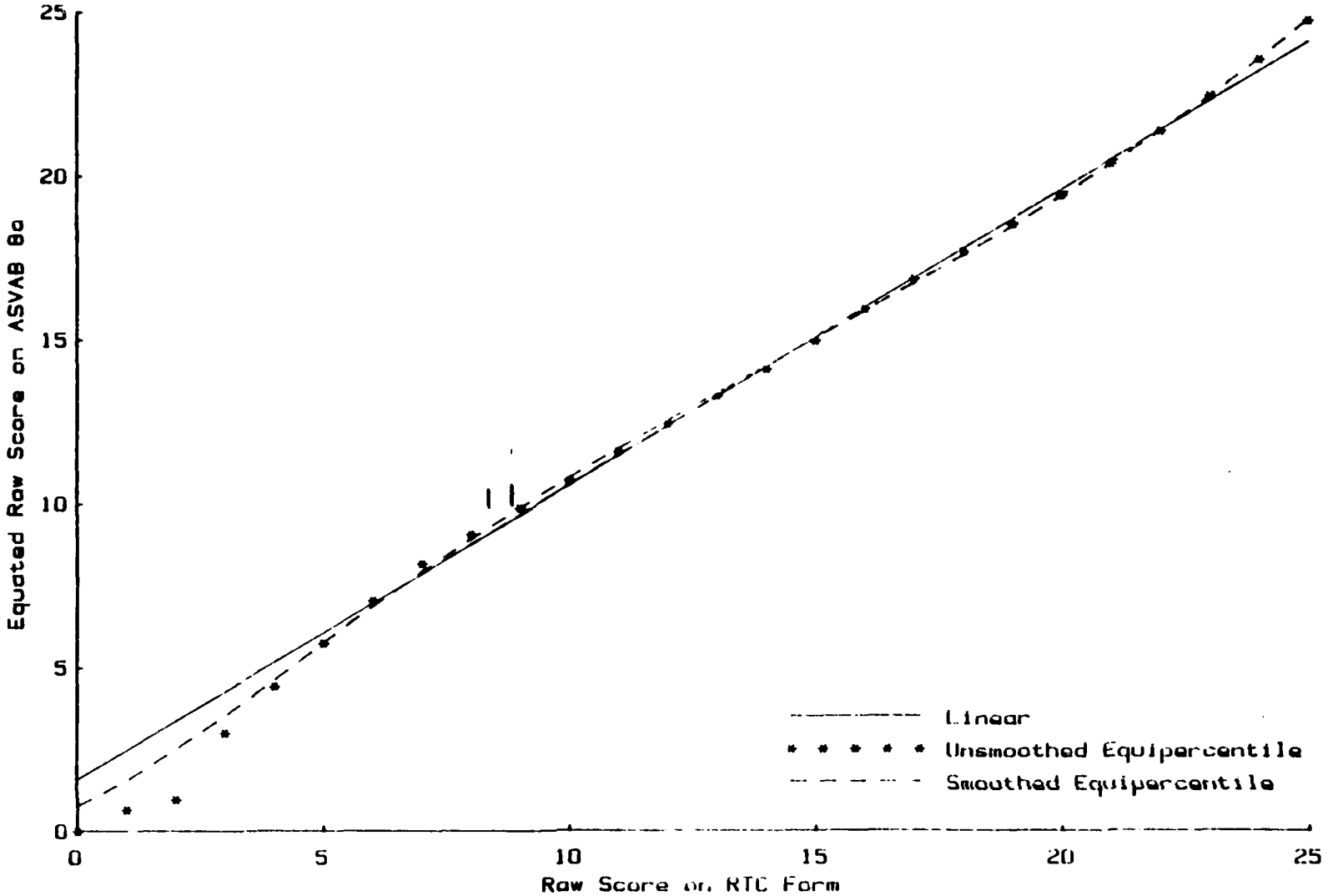

Figure A-73. Equating Transformations for Raw General Science Scores Based on the Average RTC Form.

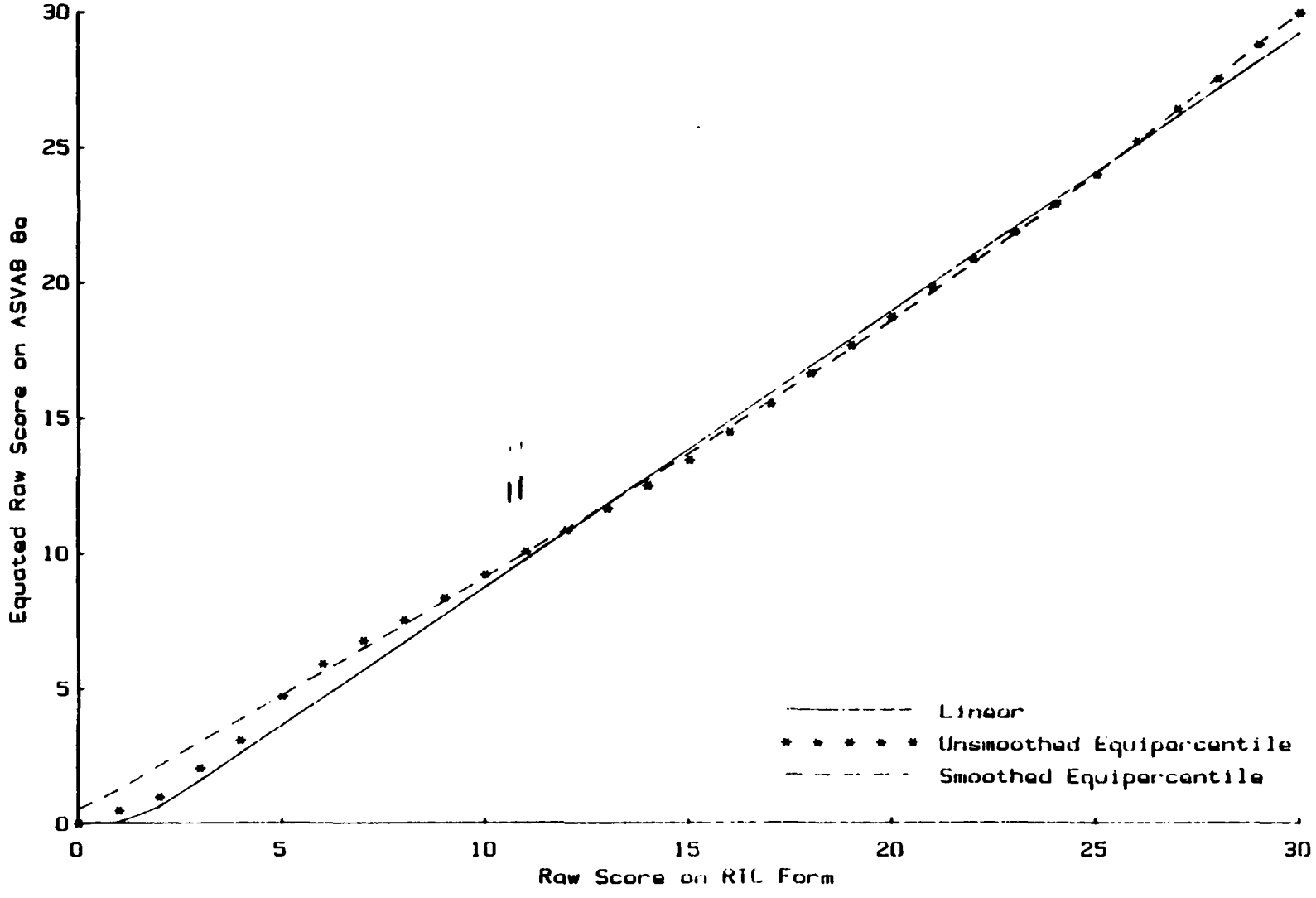

Figure A-74. Equating Transformations for Raw Arithmetic Reasoning Scores Based on the Average RTC Form.

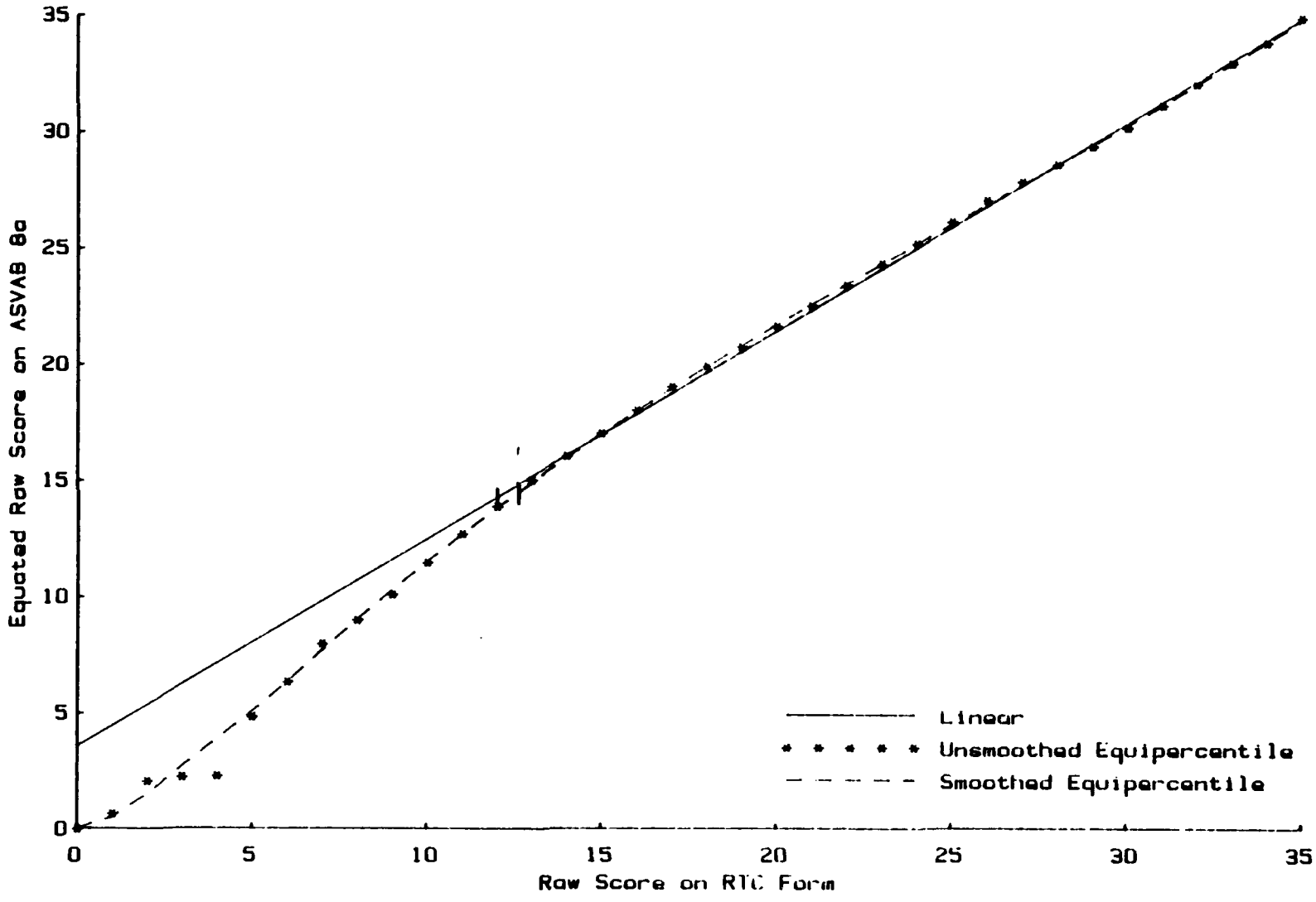

Figure A-75. Equating Transformations for Raw Word Knowledge Scores Based on the Average RTC Form.

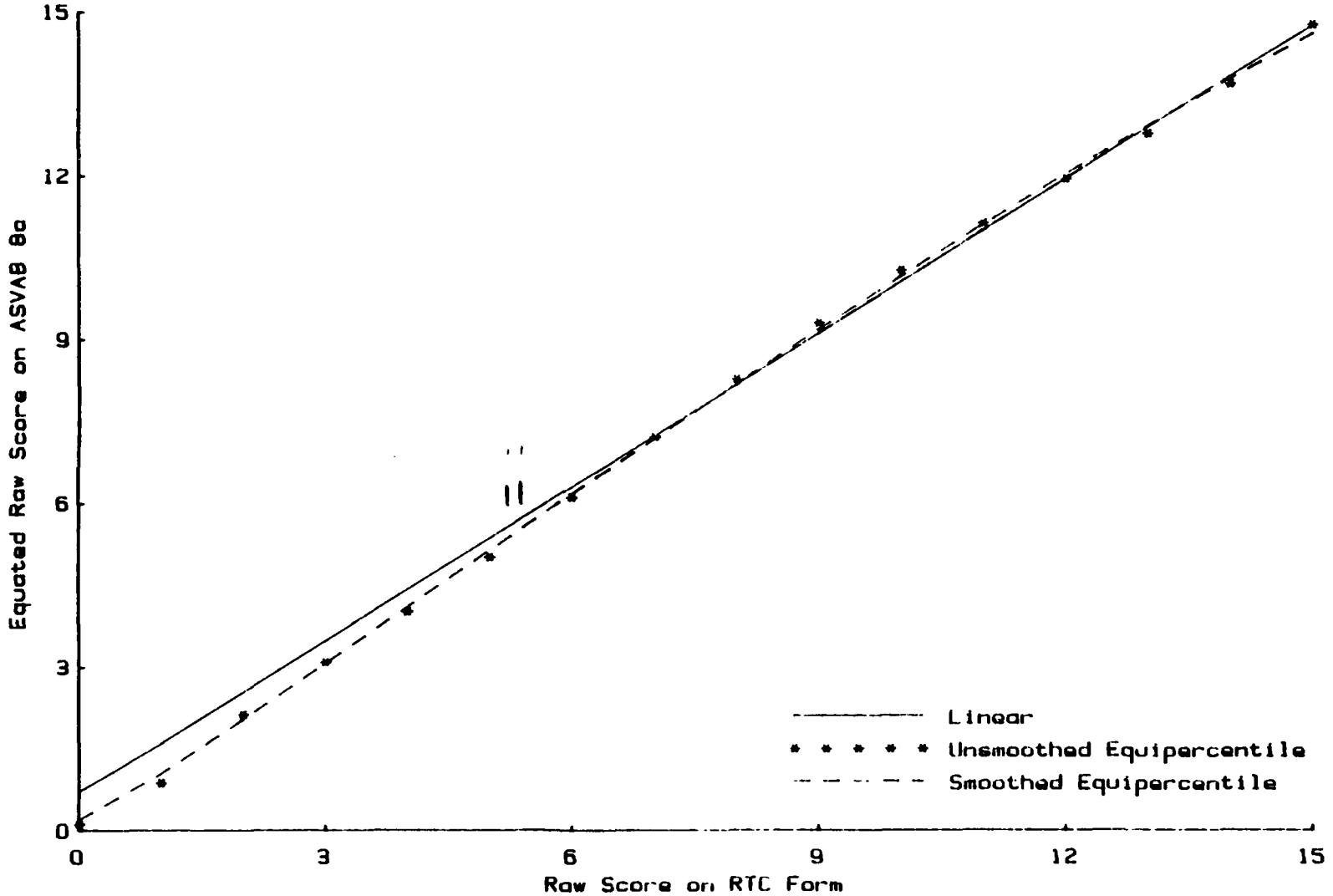

Figure A-76. Equating Transformations for Raw Paragraph Comprehension Scores Based on the Average RTC Form.

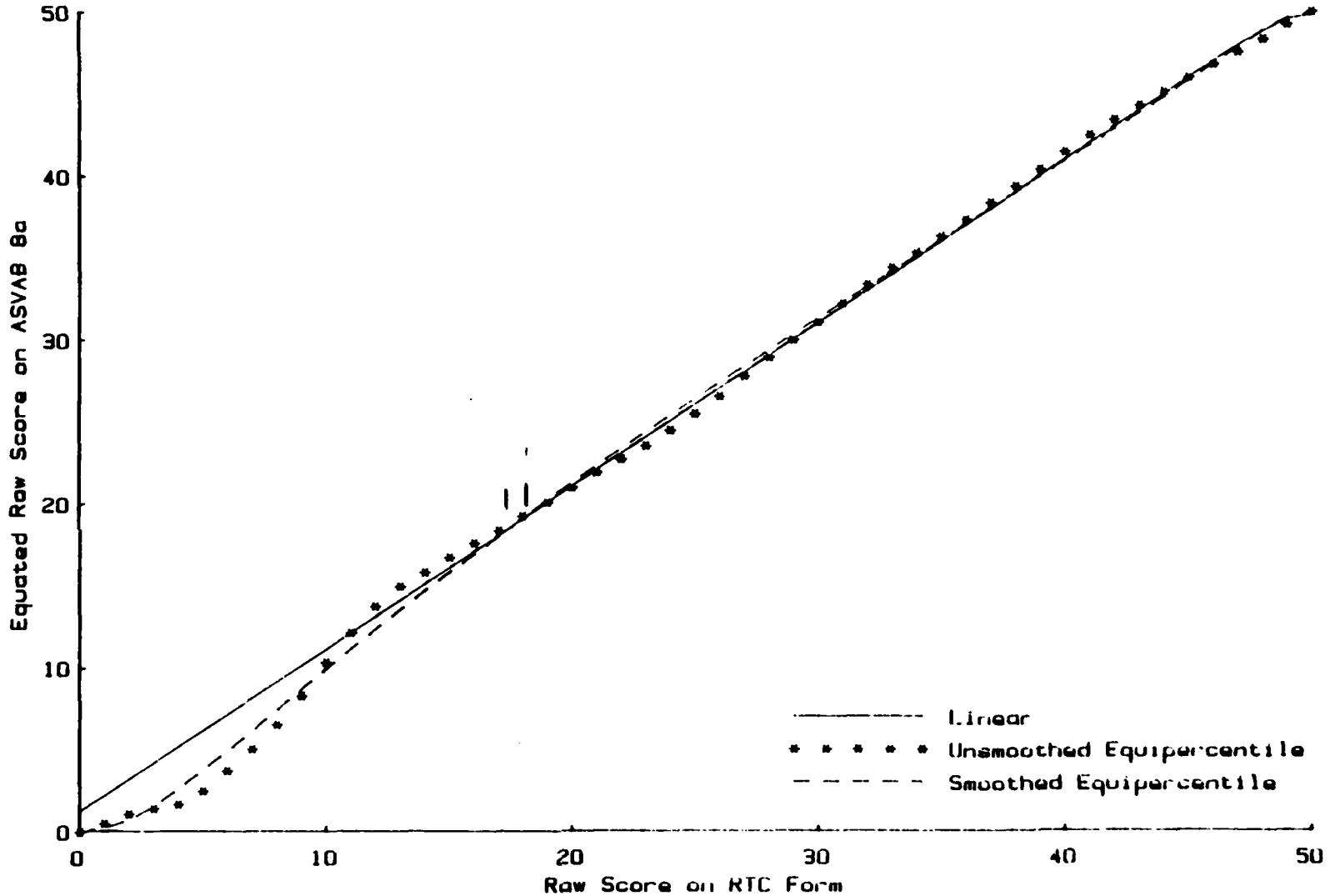

Figure A-77. Equating Transformations for Raw Numerical Operations Scores Based on the Average RTC Form.

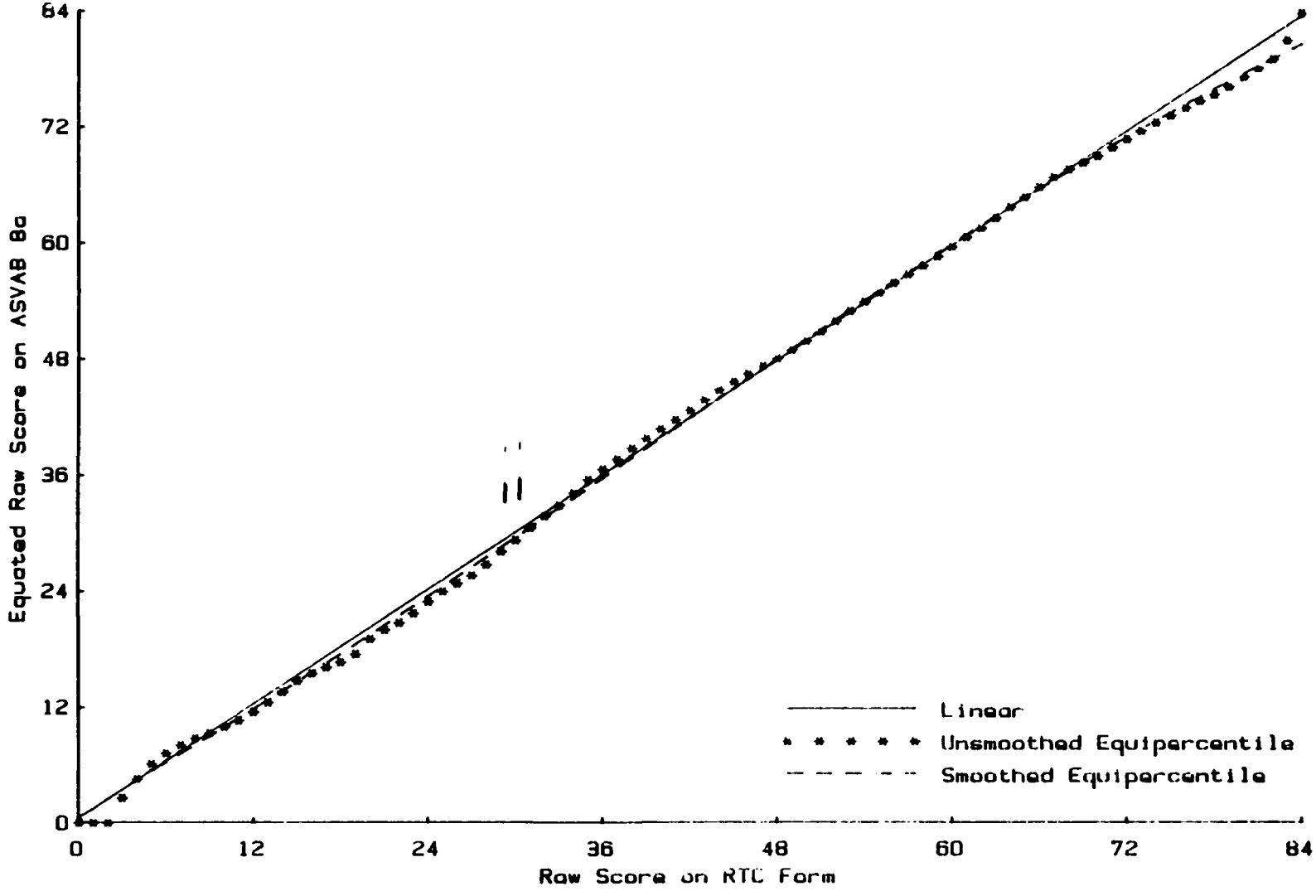

Figure A-78. Equating Transformations for Raw Coding Speed Scores Based on the Average RTC Form.

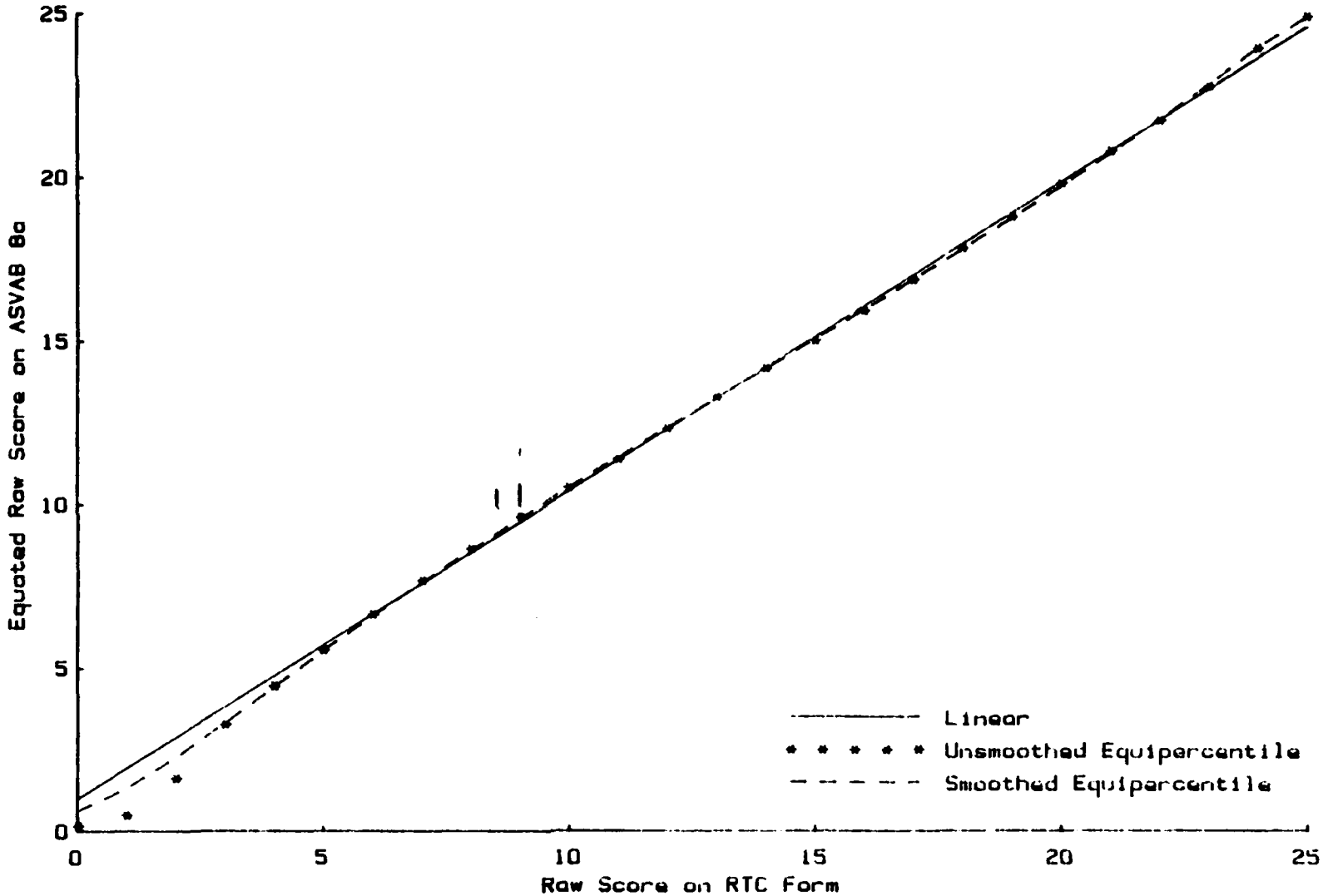

Figure A-79. Equating Transformations for Raw Auto & Shop Information Scores Based on the Average RTC Form.

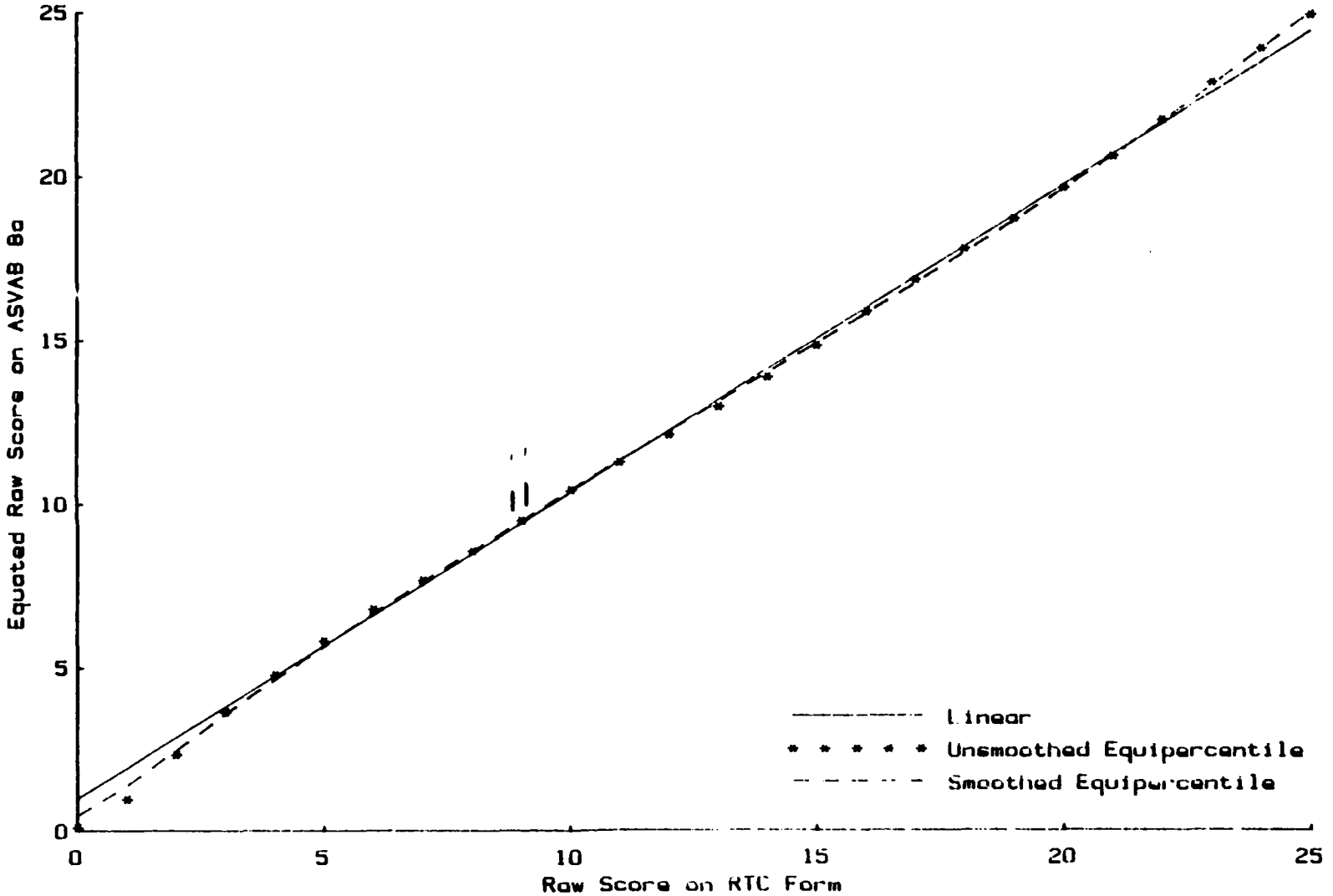

Figure A-80. Equating Transformations for Raw Mathematics Knowledge Scores Based on the Average RTC Form.

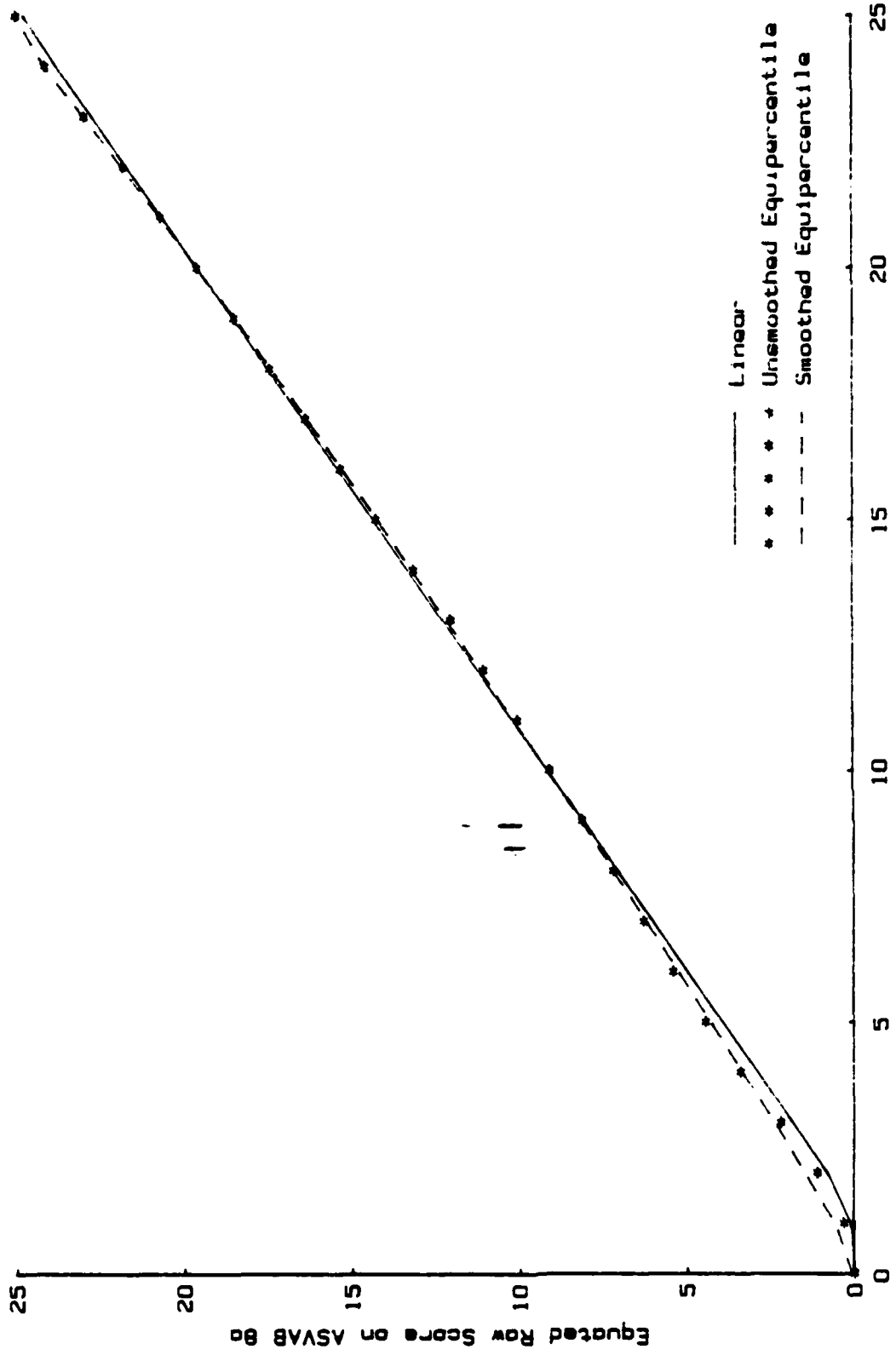

Figure A-81. Equating Transformations for Raw Mechanical Comprehension Scores Based on the Average RTC Form.

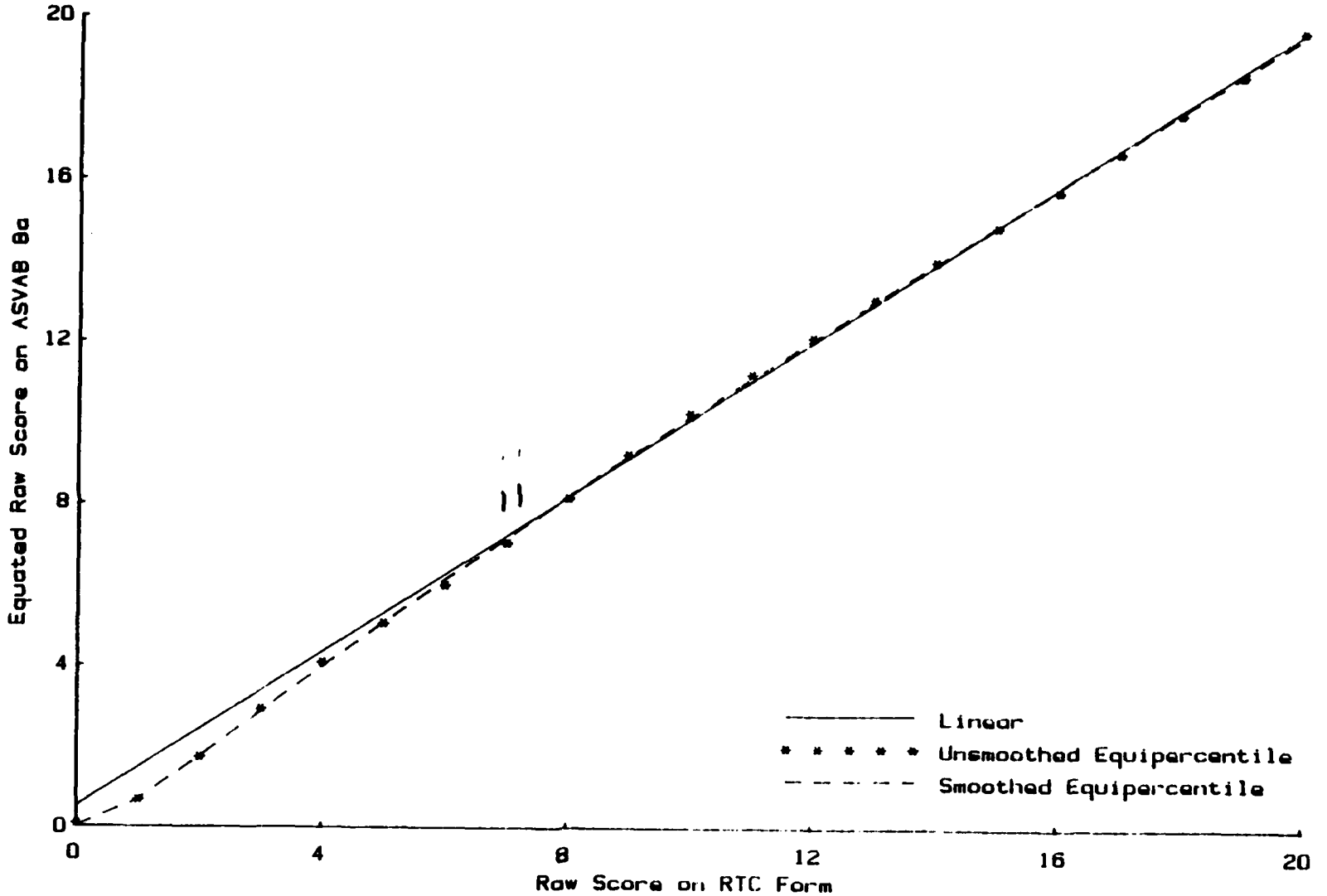

Figure A-82. Equating Transformations for Raw Electronics Information Scores Based on the Average RTC Form.

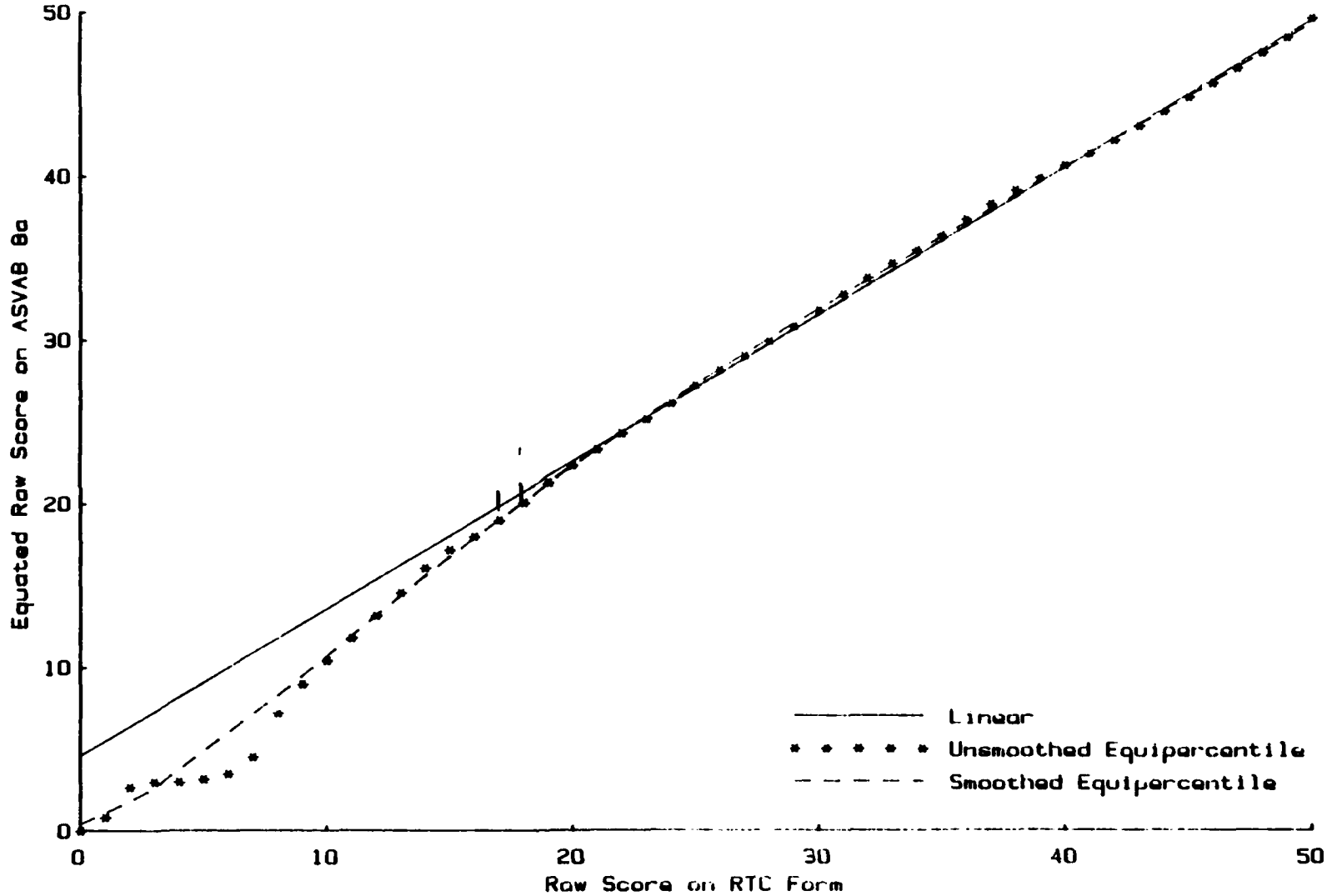

Figure A-83. Equating Transformations for Raw Verbal Composite Scores Based on the Average RTC Form.

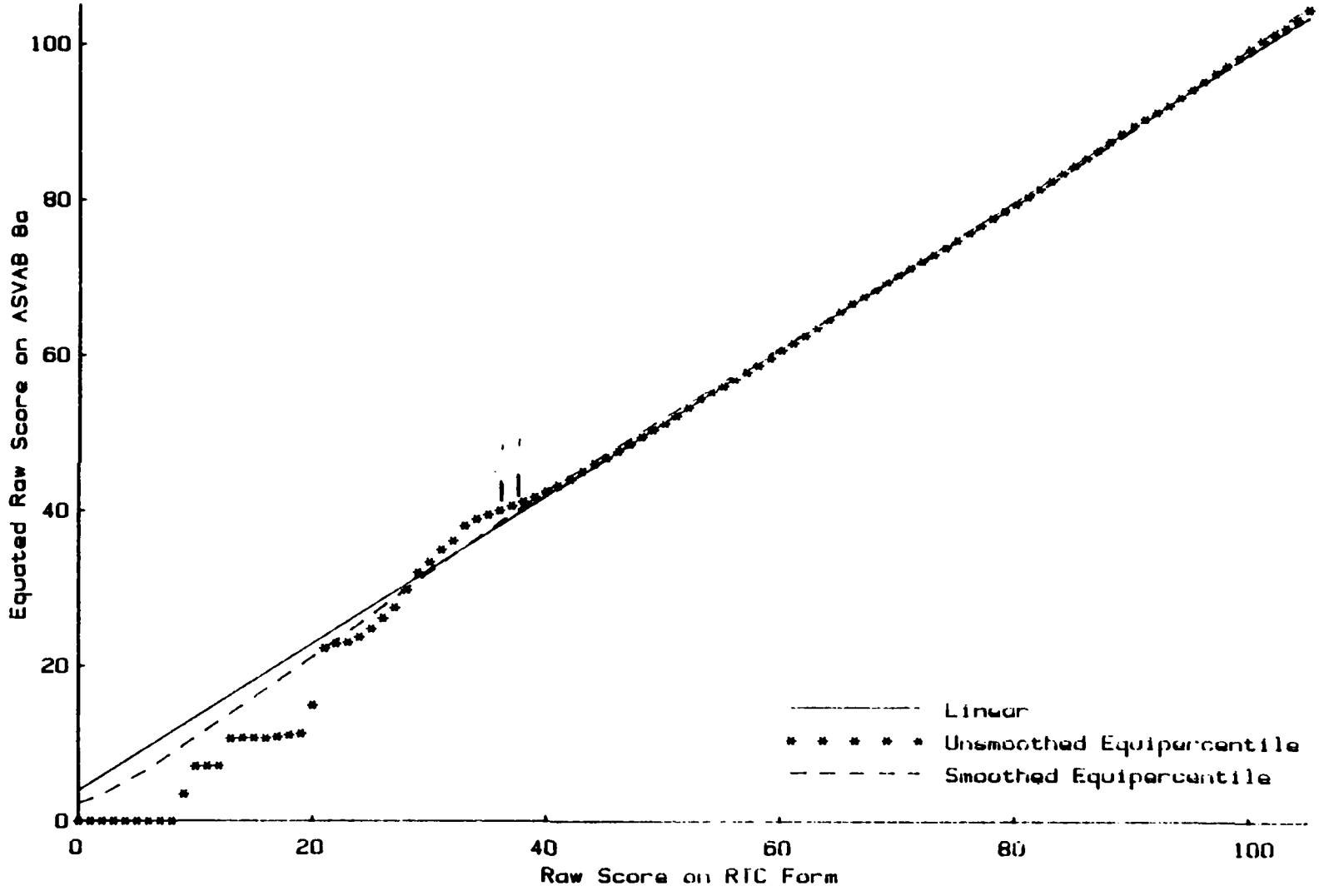

Figure A-84. Equating Transformations for Raw AFQT Composite Scores Based on the Average RTC Form.

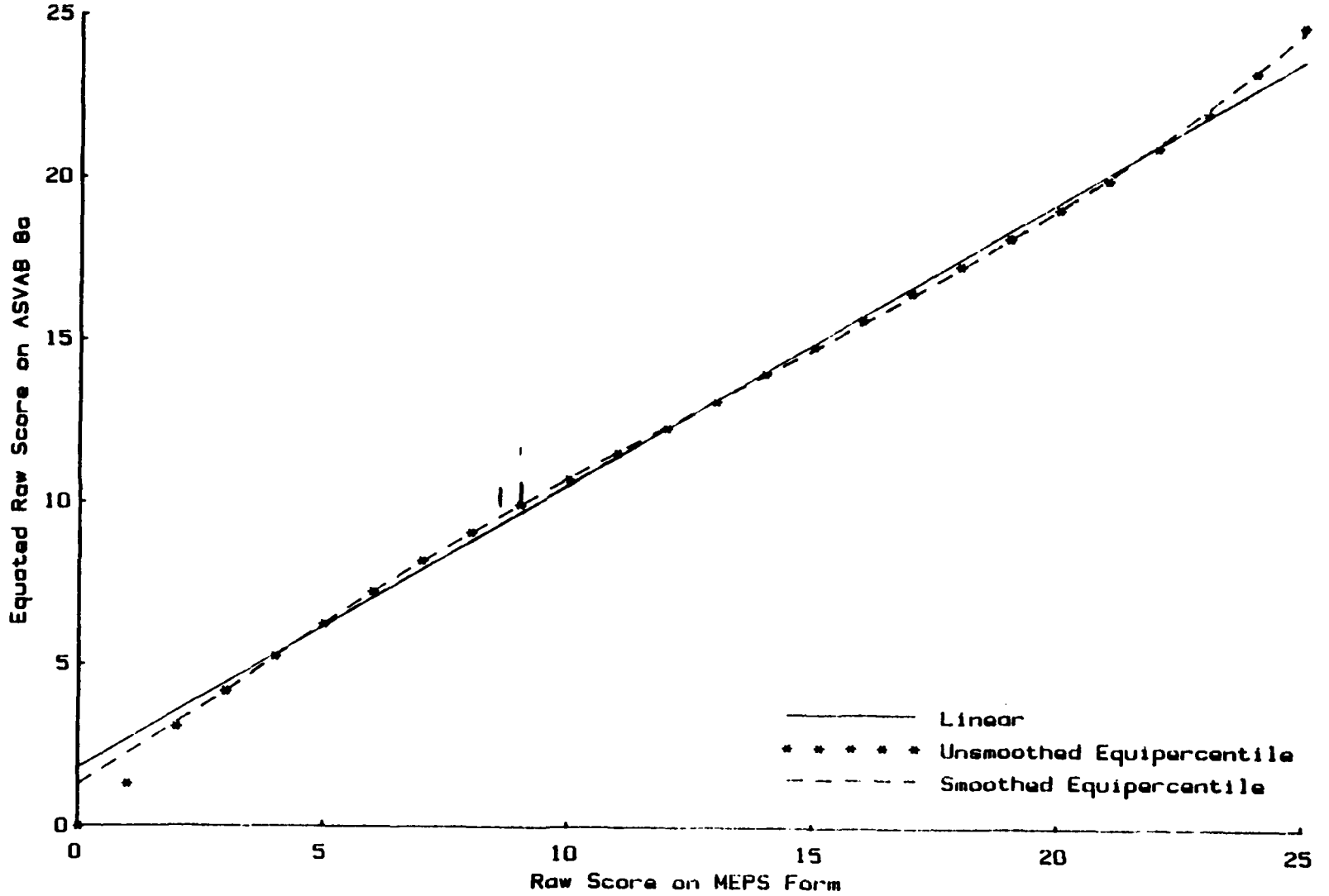

Figure A-85. Equating Transformations for Raw General Science Scores from the MEPS Form (ASVAB 11a).

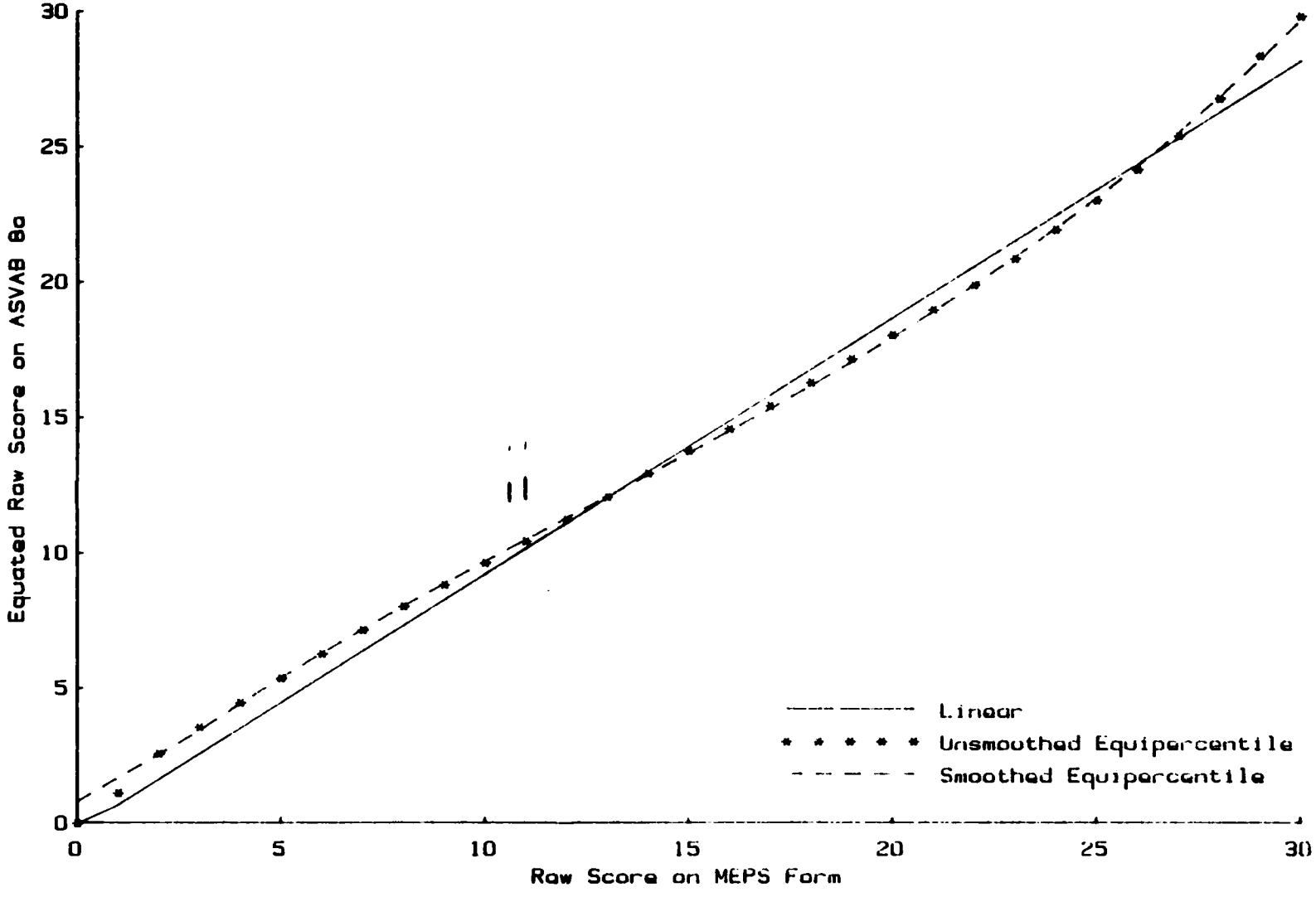

Figure A-86. Equating Transformations for Raw Arithmetic Reasoning Scores from the MEPS Form (ASVAB 11a).

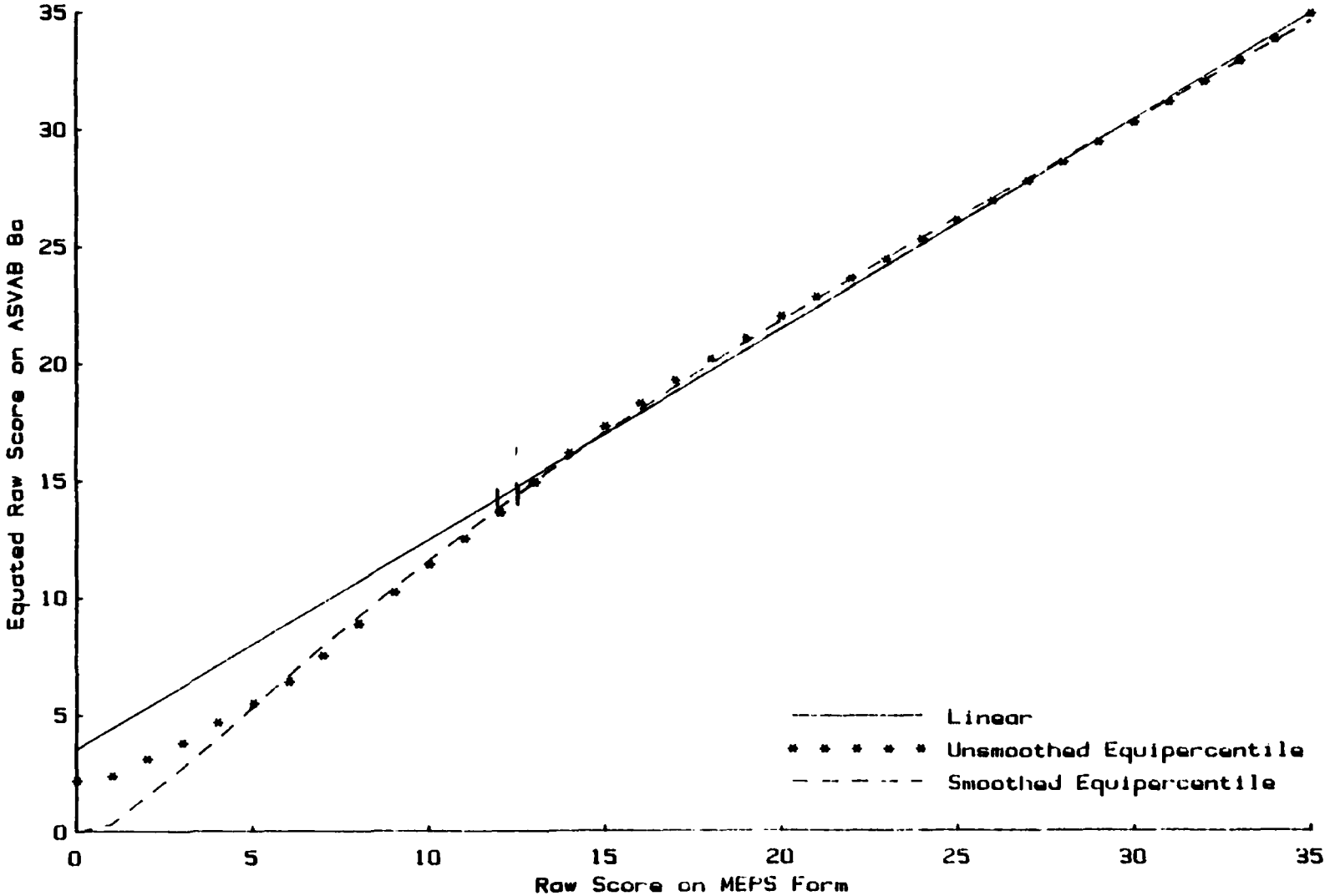

Figure A-87. Equating Transformations for Raw Word Knowledge Scores from the MEPS Form (ASVAB 11a).

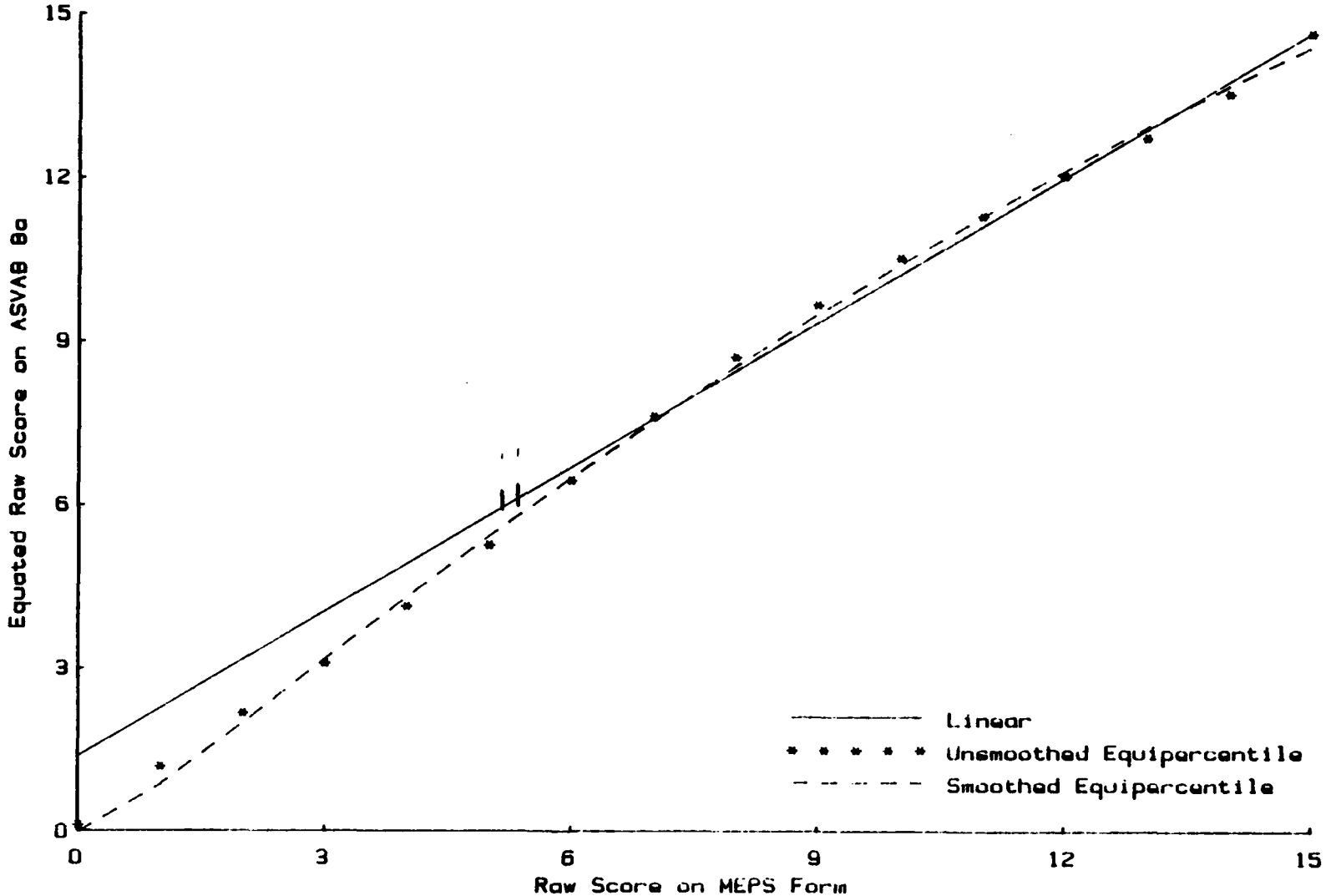

Figure A-88. Equating Transformations for Raw Paragraph Comprehension Scores from the MEPS Form (ASVAB 11a).

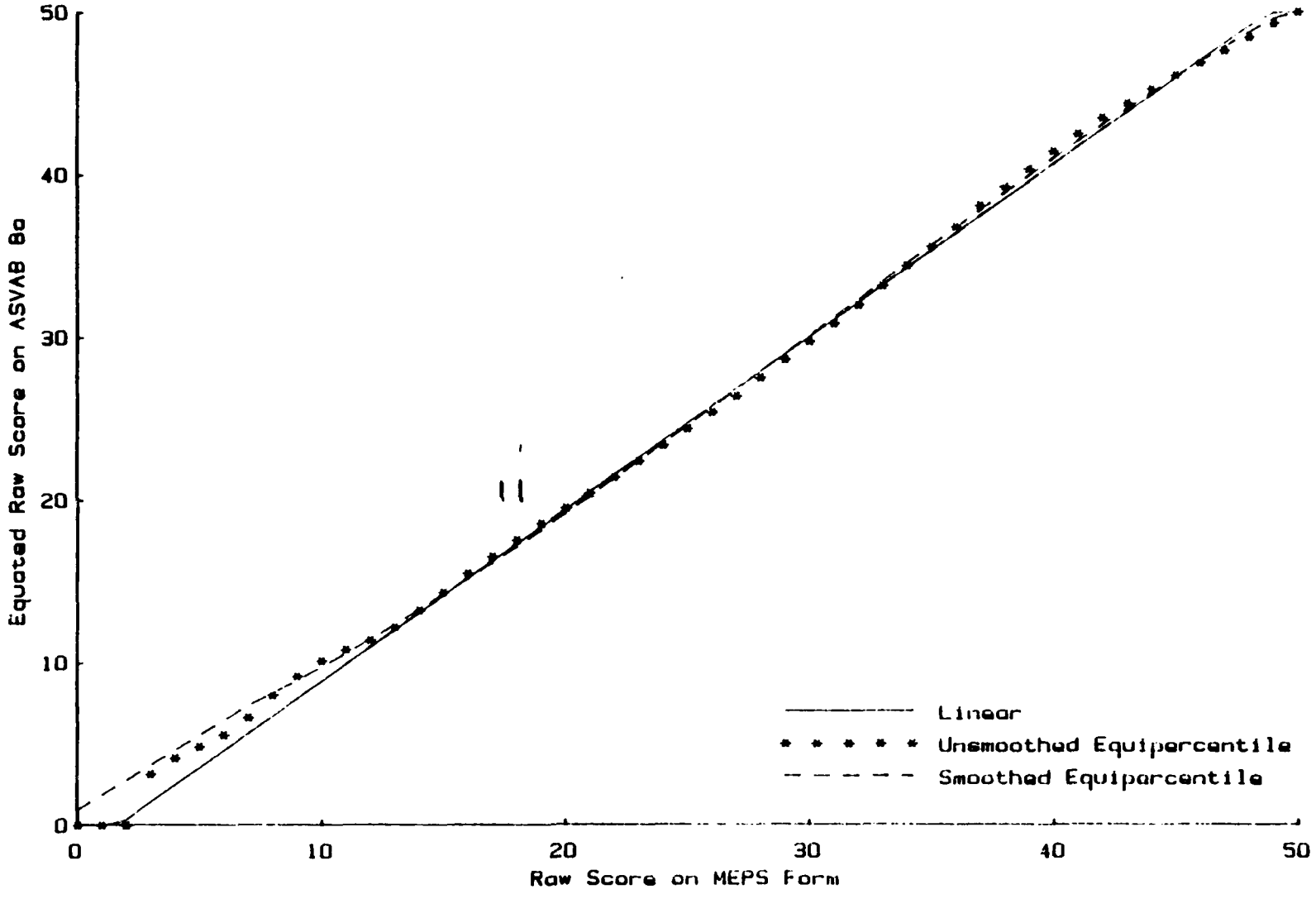

Figure A-89. Equating Transformations for Raw Numerical Operations Scores from the MEPS Form (ASVAB 11a).

AD-A160 585 ARMED SERVICES VOCATIONAL APTITUDE BATTERY: DEVELOPMENT 2/2
OF FORMS 11 12 AN (U) ASSESSMENT SYSTEMS CORP ST PAUL
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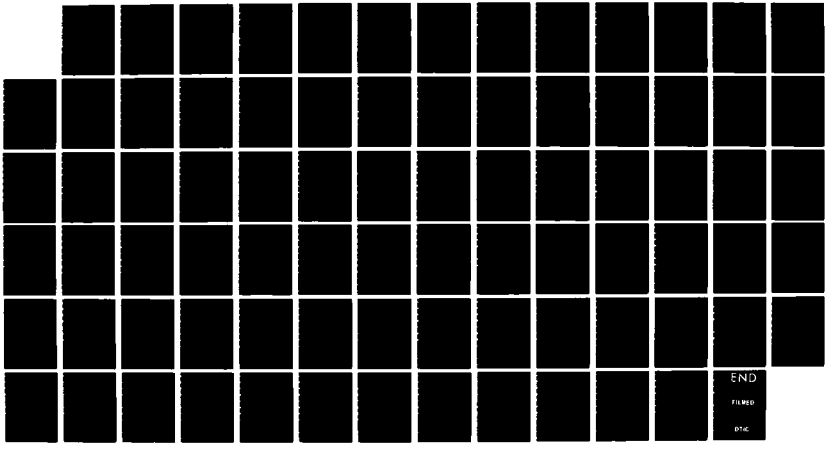
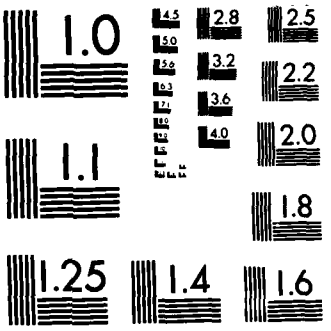
UNCLASSIFIED F33615-81-C-0020 F/G 5/10 NL





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NATIONAL BUREAU OF STANDARDS-1963-A

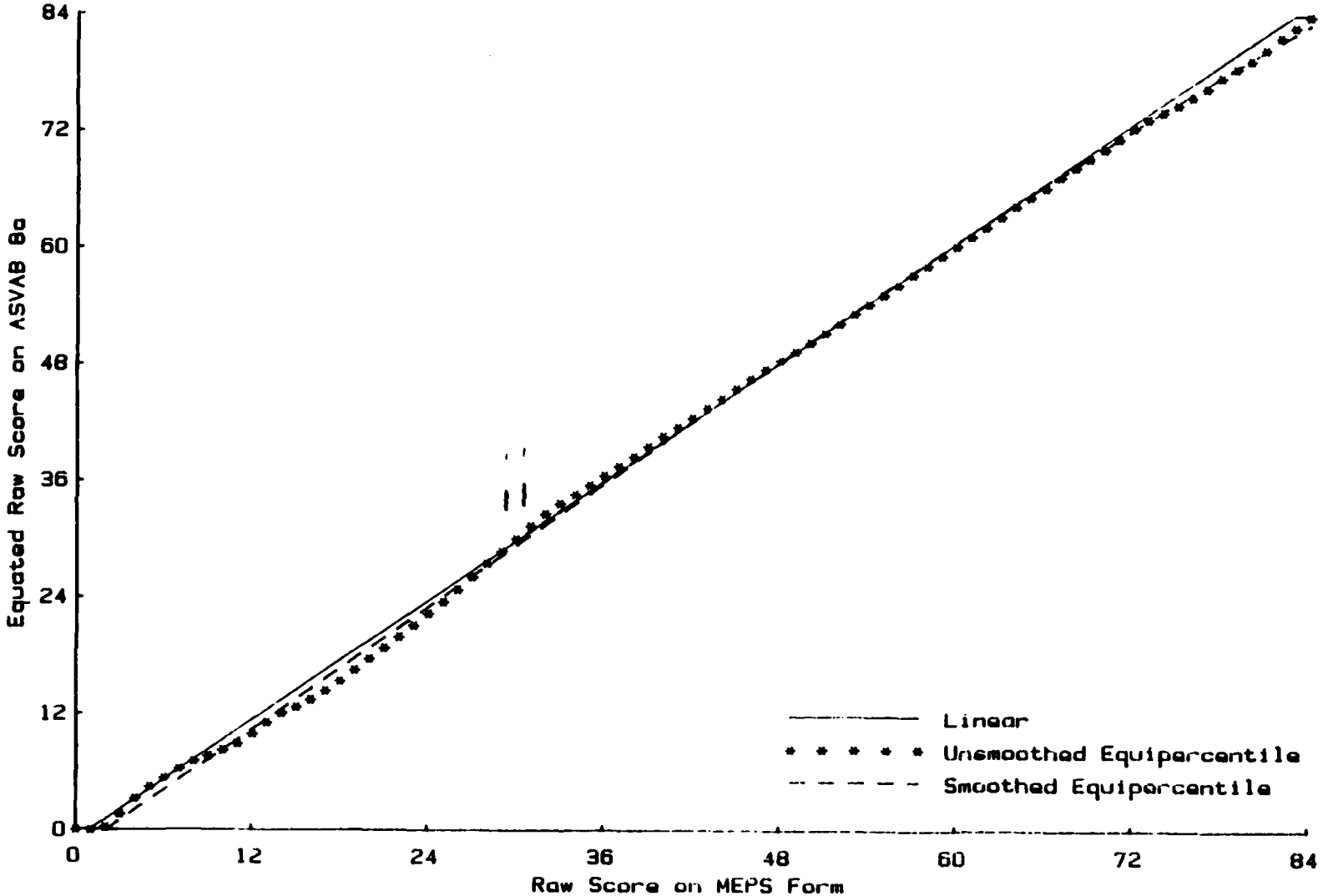

Figure A-90. Equating Transformations for Raw Coding Speed Scores from the MEPS Form (ASVAB 11a).

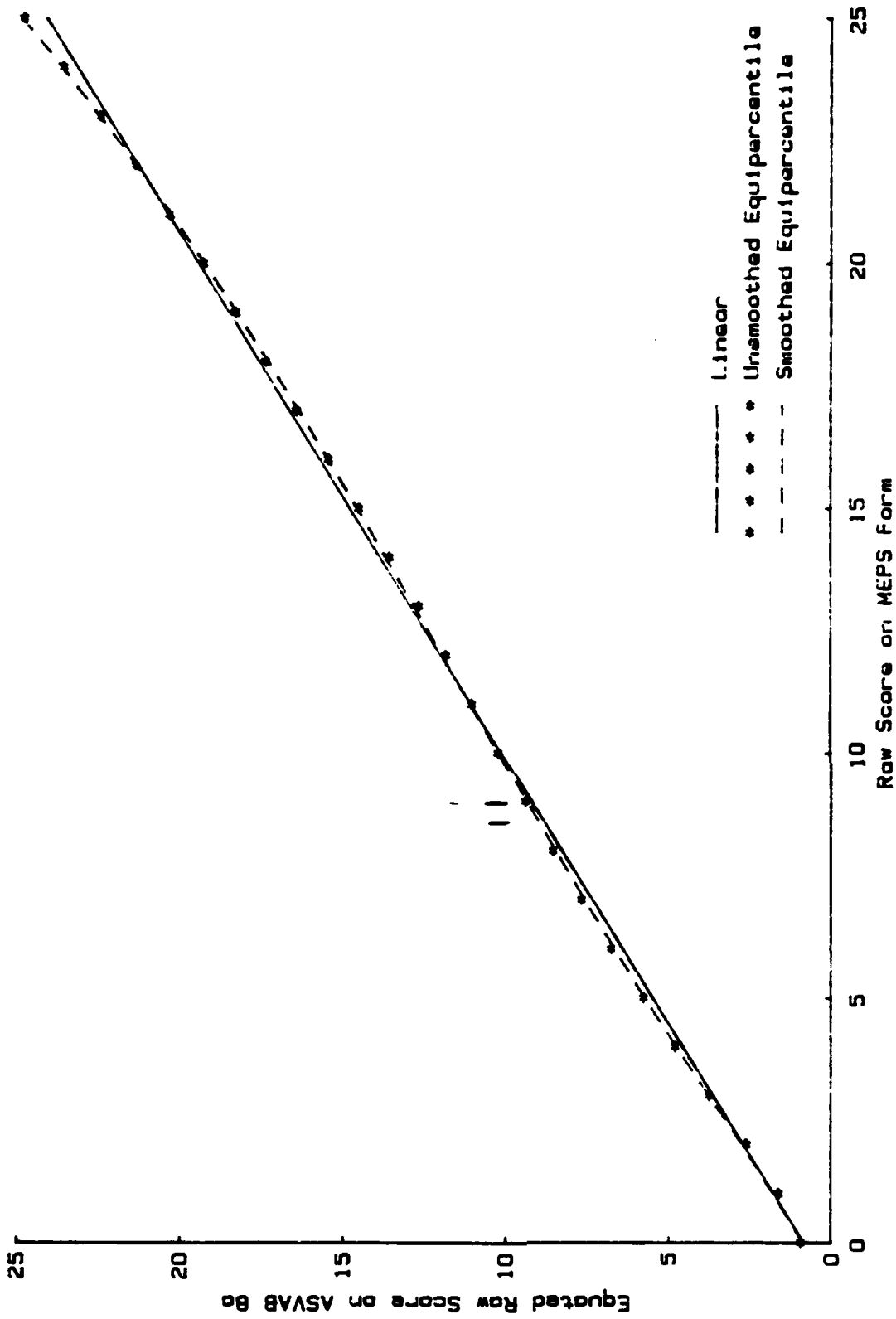

Figure A-81. Equating Transformations for Raw Auto & Shop Information Scores from the MEPS Form (ASVAB 11a).

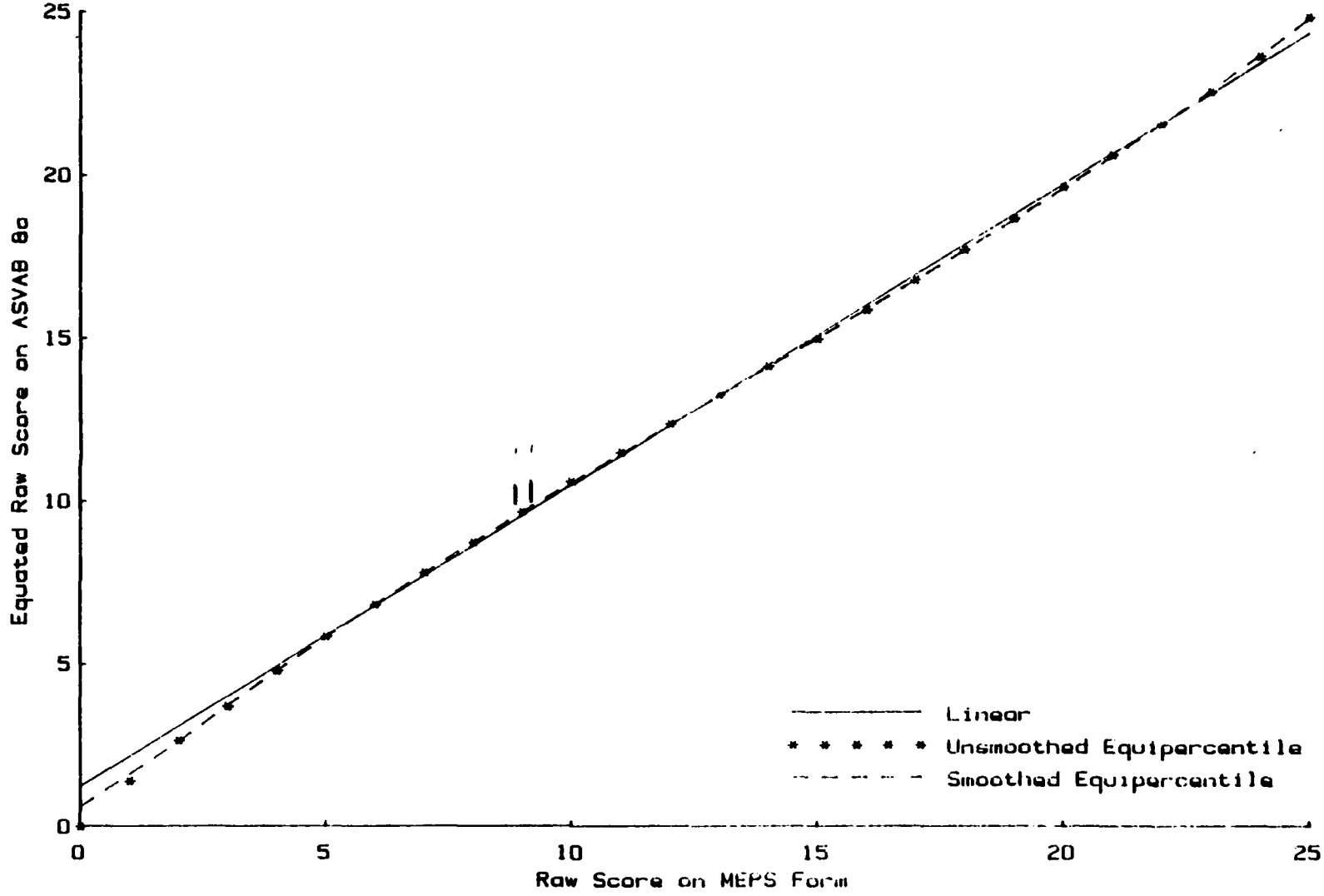

Figure A-92. Equating Transformations for Raw Mathematics Knowledge Scores from the MEPS Form (ASVAB 11a).

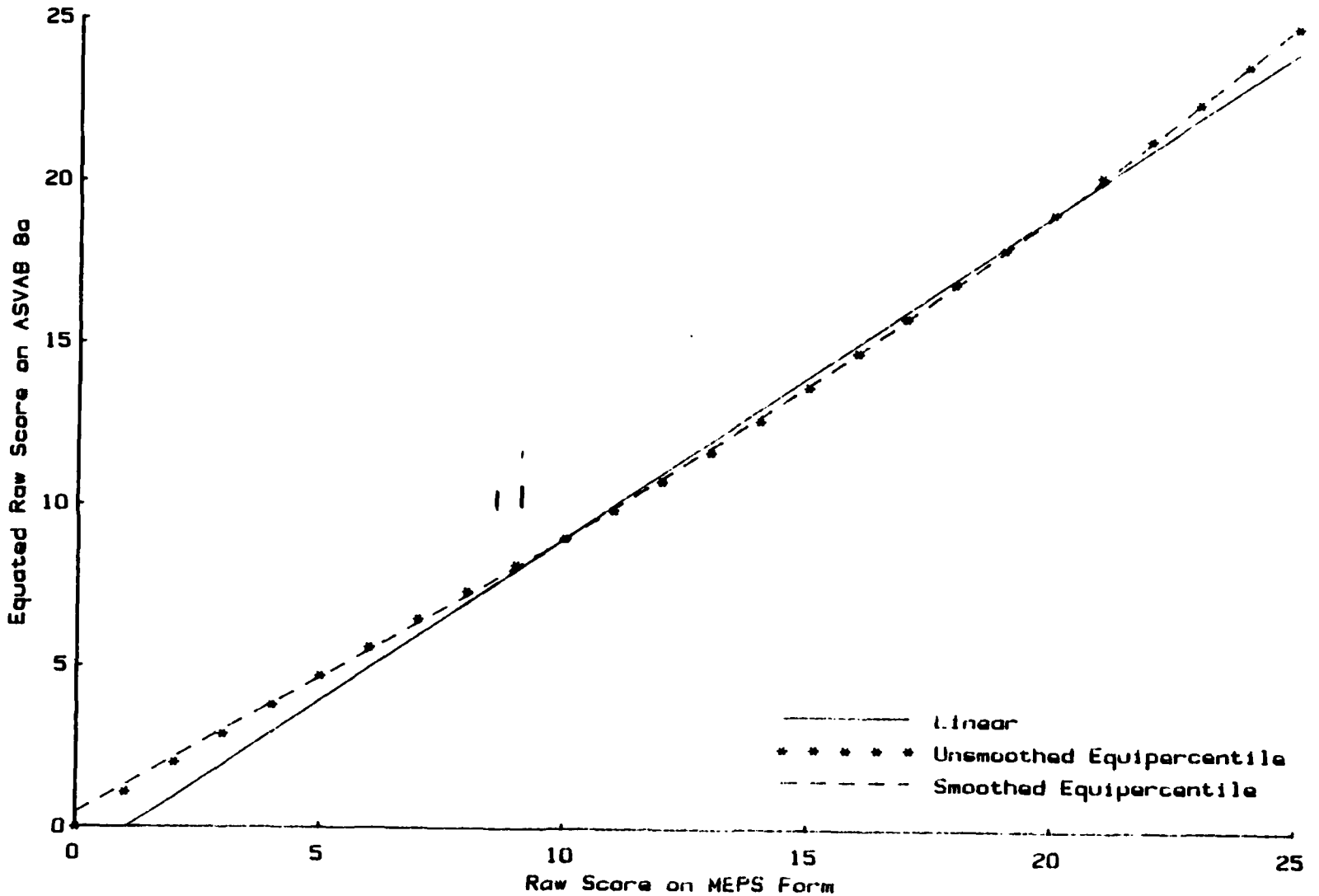

Figure A-93. Equating Transformations for Raw Mechanical Comprehension Scores from the MEPS Form (ASVAB 11a).

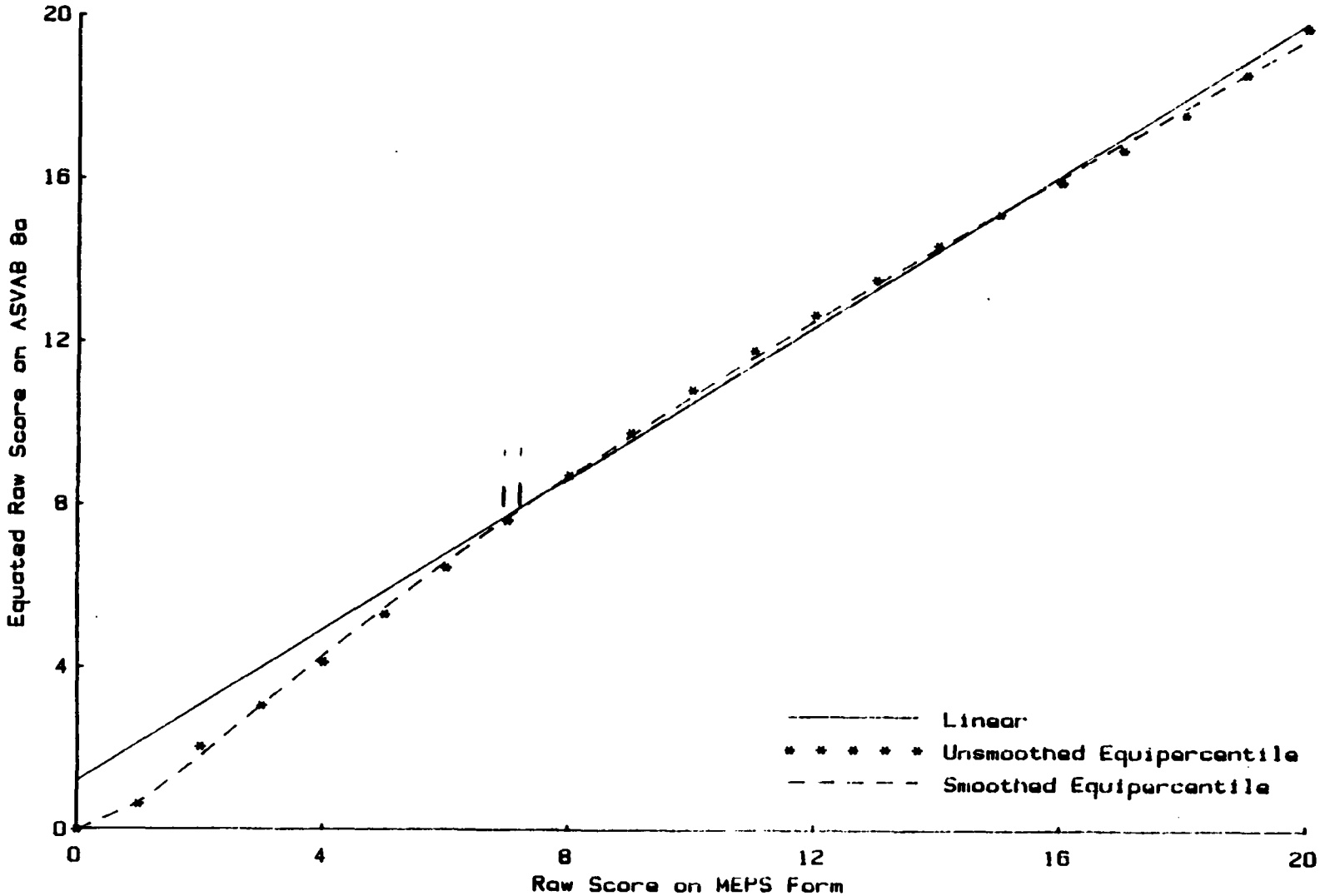

Figure A-94. Equating Transformations for Raw Electronics Information Scores from the MEPS Form (ASVAB 11a).

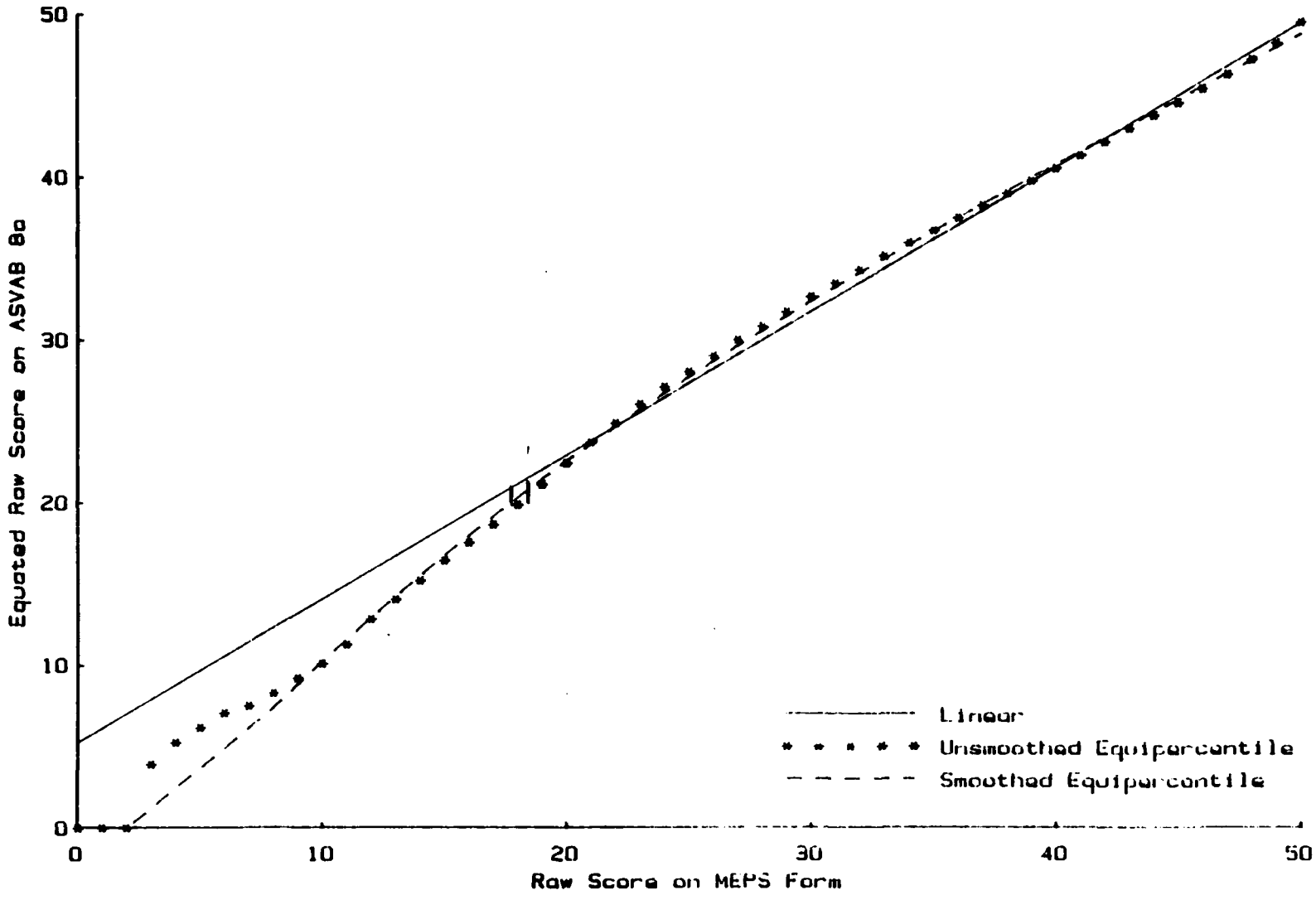

Figure A-95. Equating Transformations for Raw Verbal Composite Scores from the MEPS Form (ASVAB 11a).

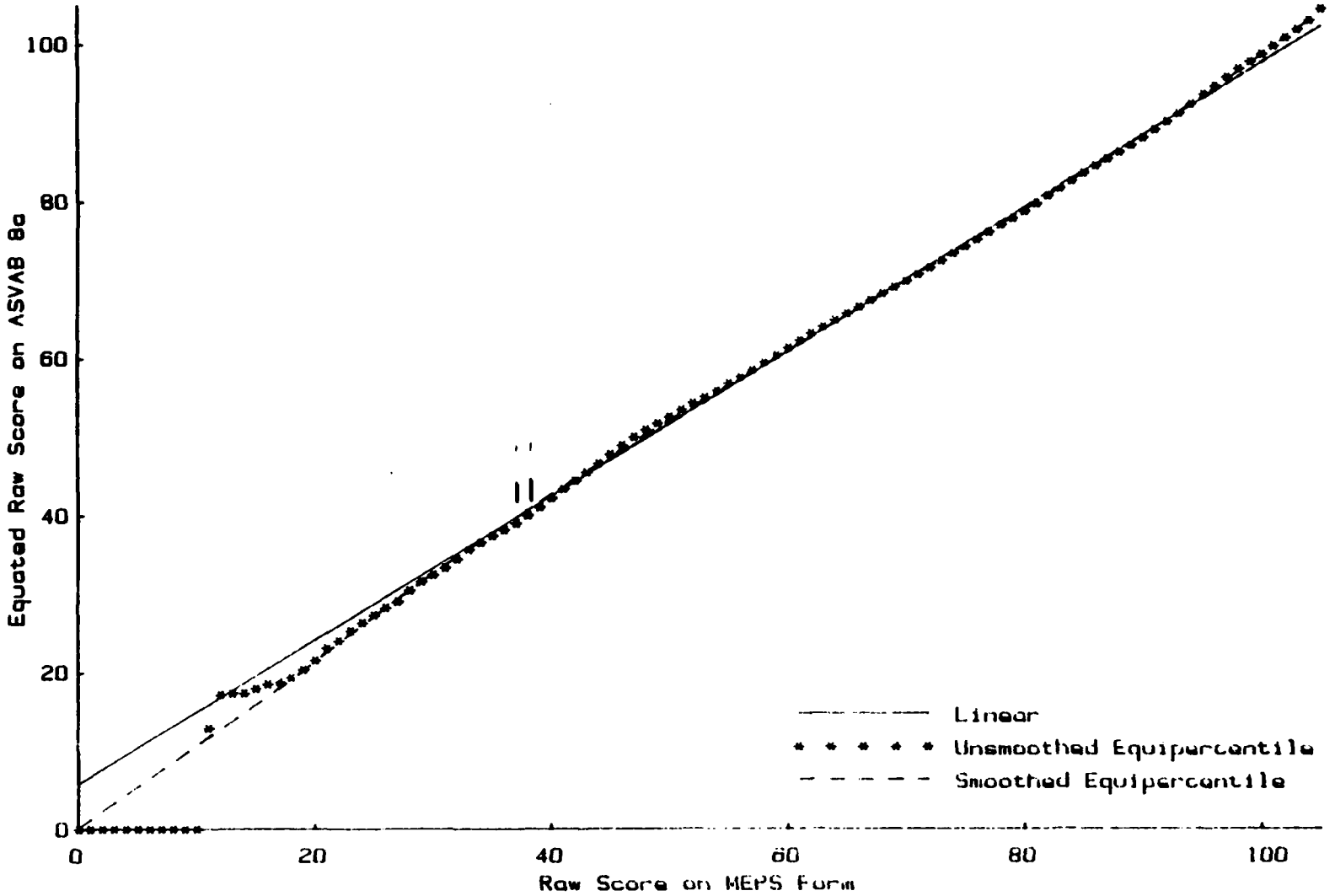

Figure A-96. Equating Transformations for Raw AFQT Composite Scores from the MEPS Form (ASVAB 11a).

PART B

PLOTS COMPARING THE LINEAR AND SMOOTHED EQUIPERCENTILE EQUATING TRANSFORMATIONS FOR THE MEPS FORM WITH THOSE FOR INDIVIDUAL AND AVERAGE RTC FORMS

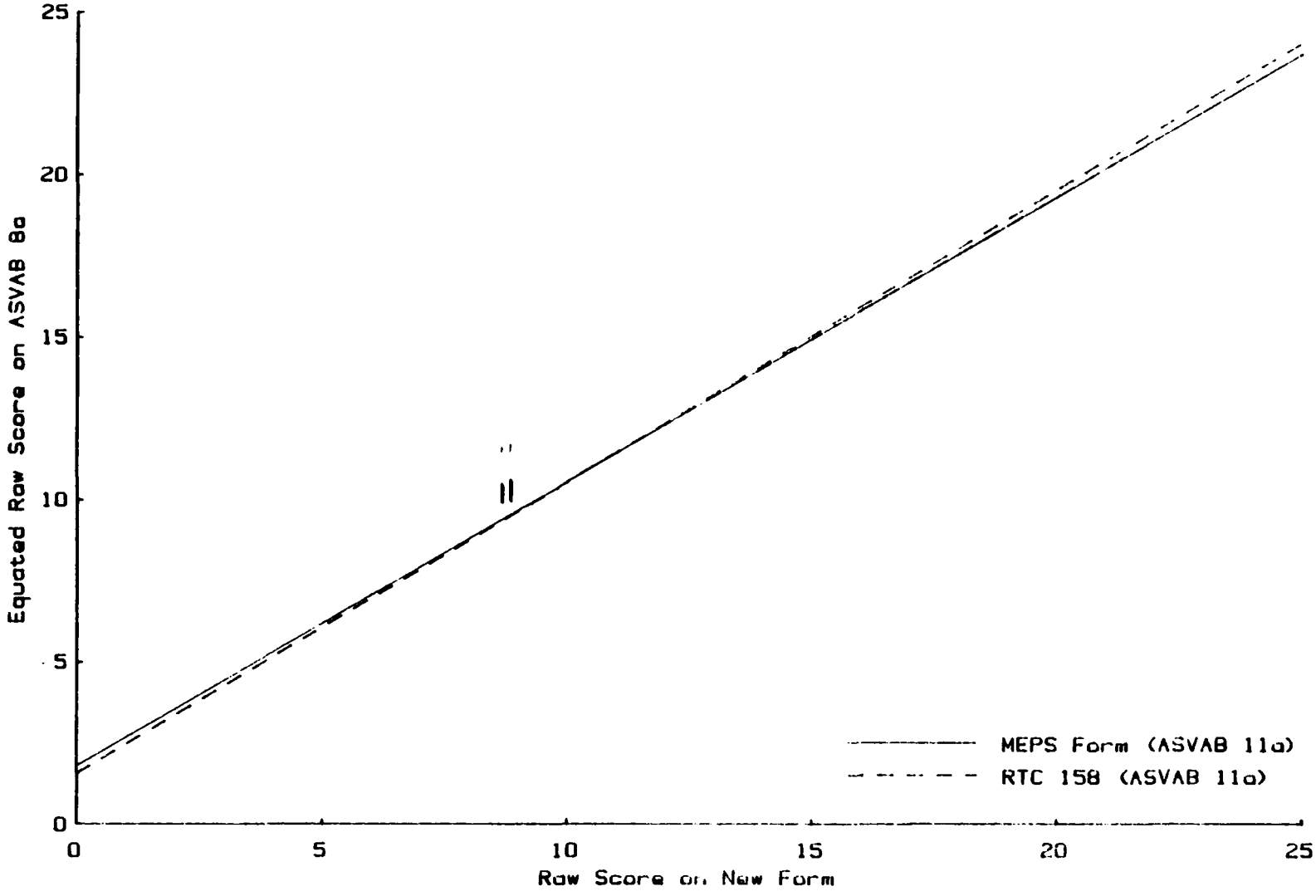

Figure B-1. Linear Equating Transformations for Raw General Science Scores.

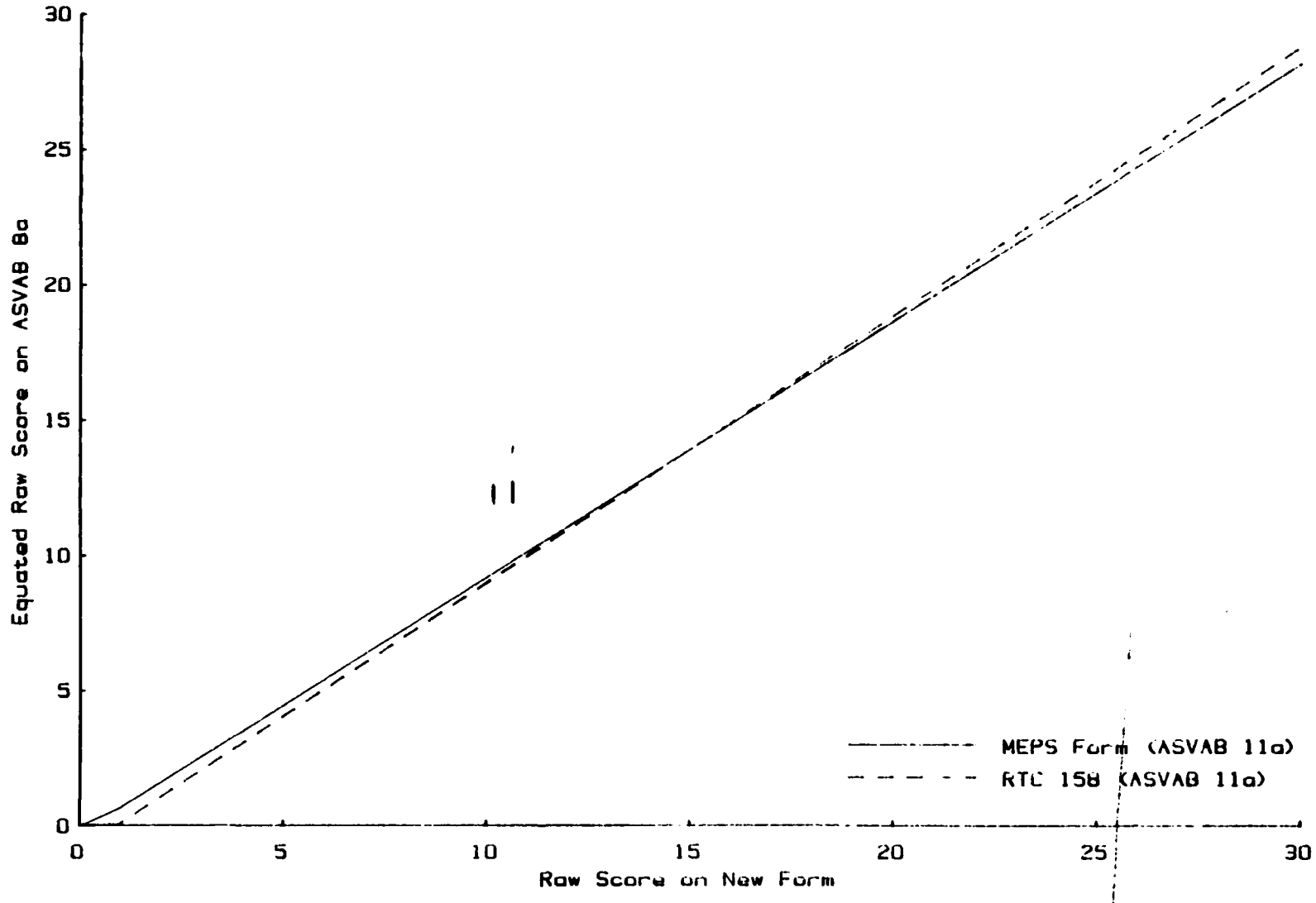

Figure 8-2. Linear Equating Transformations for Raw Arithmetic Reasoning Scores.

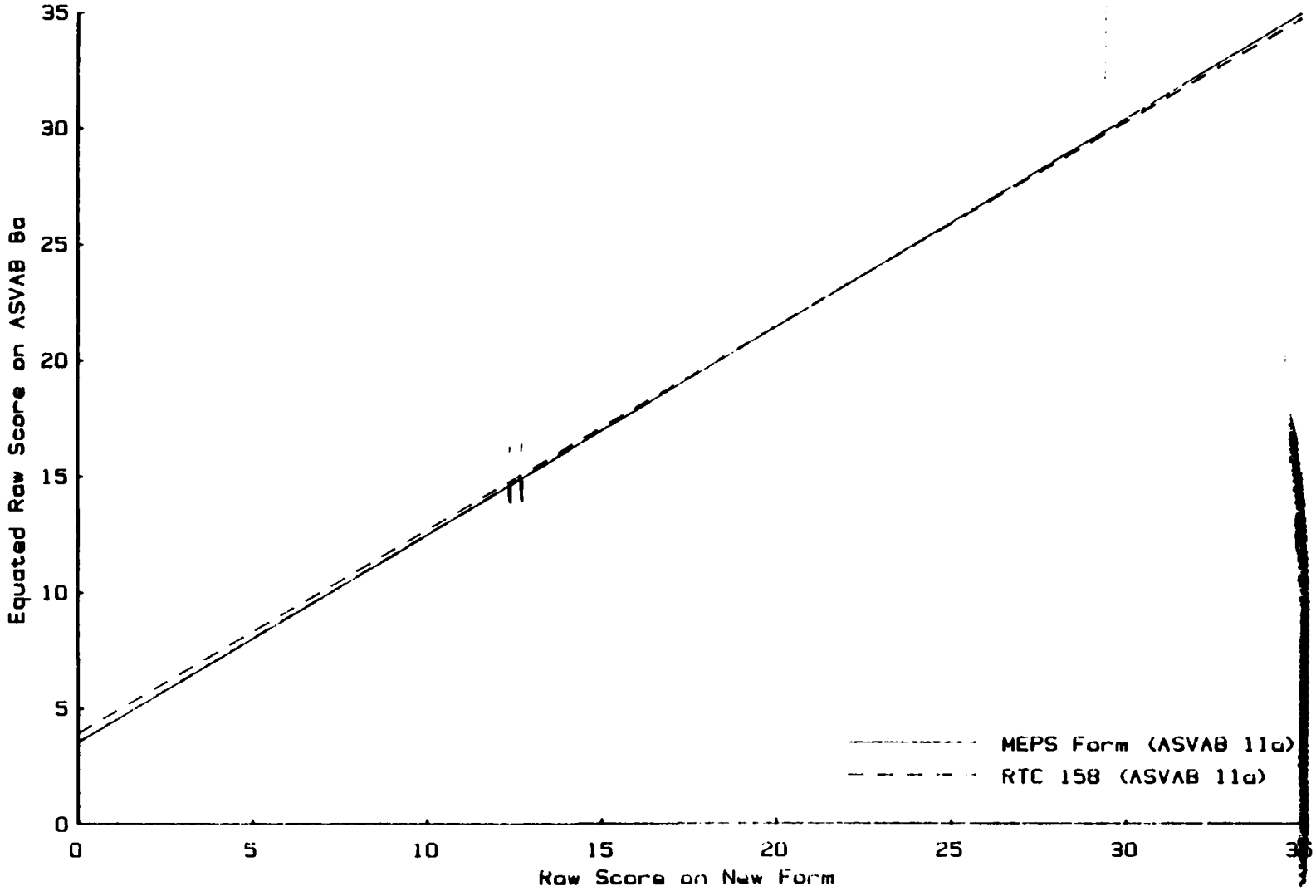

Figure B-3. Linear Equating Transformations for Raw Word Knowledge Scores.

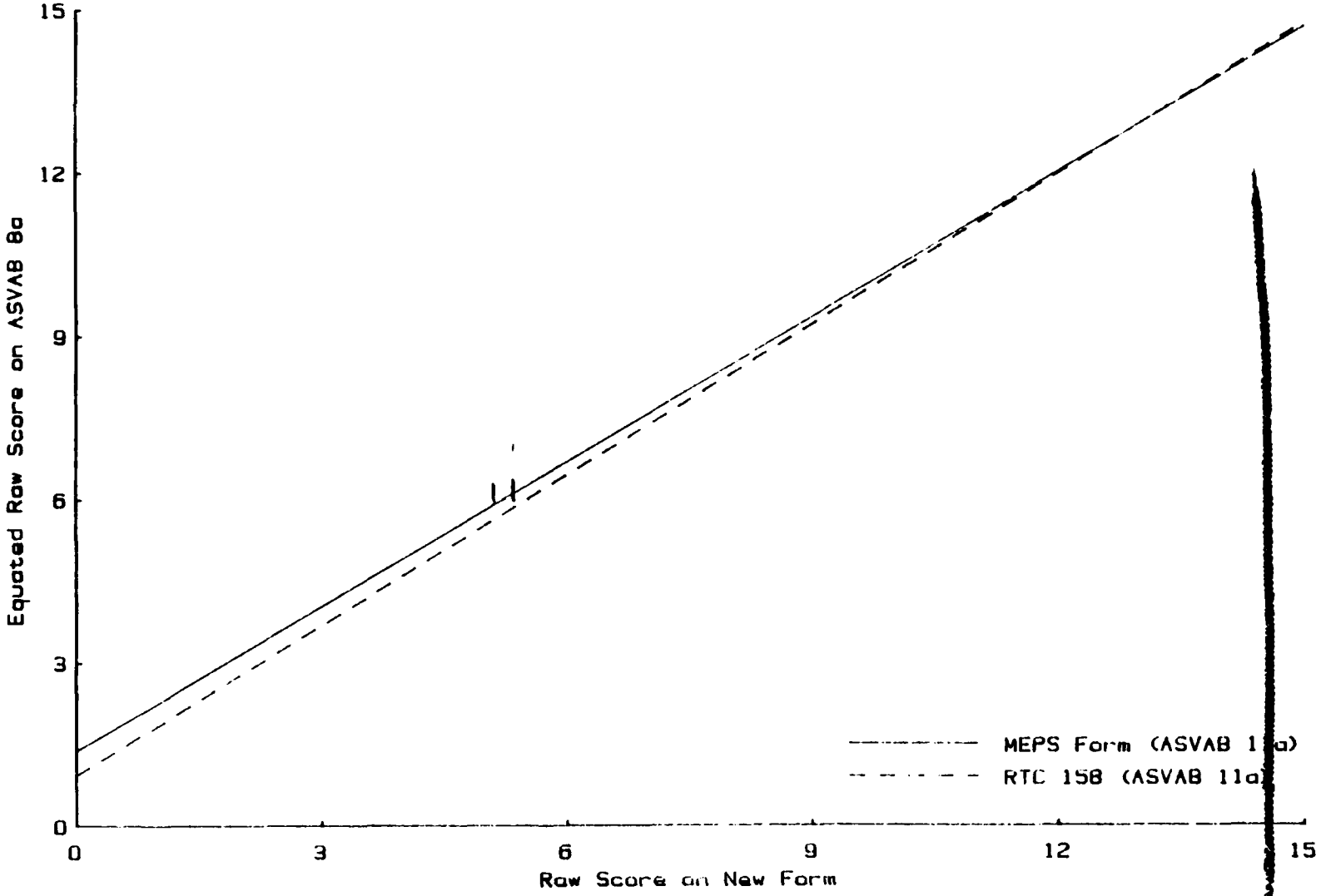

Figure B-4. Linear Equating Transformations for Raw Paragraph Comprehension Scores.

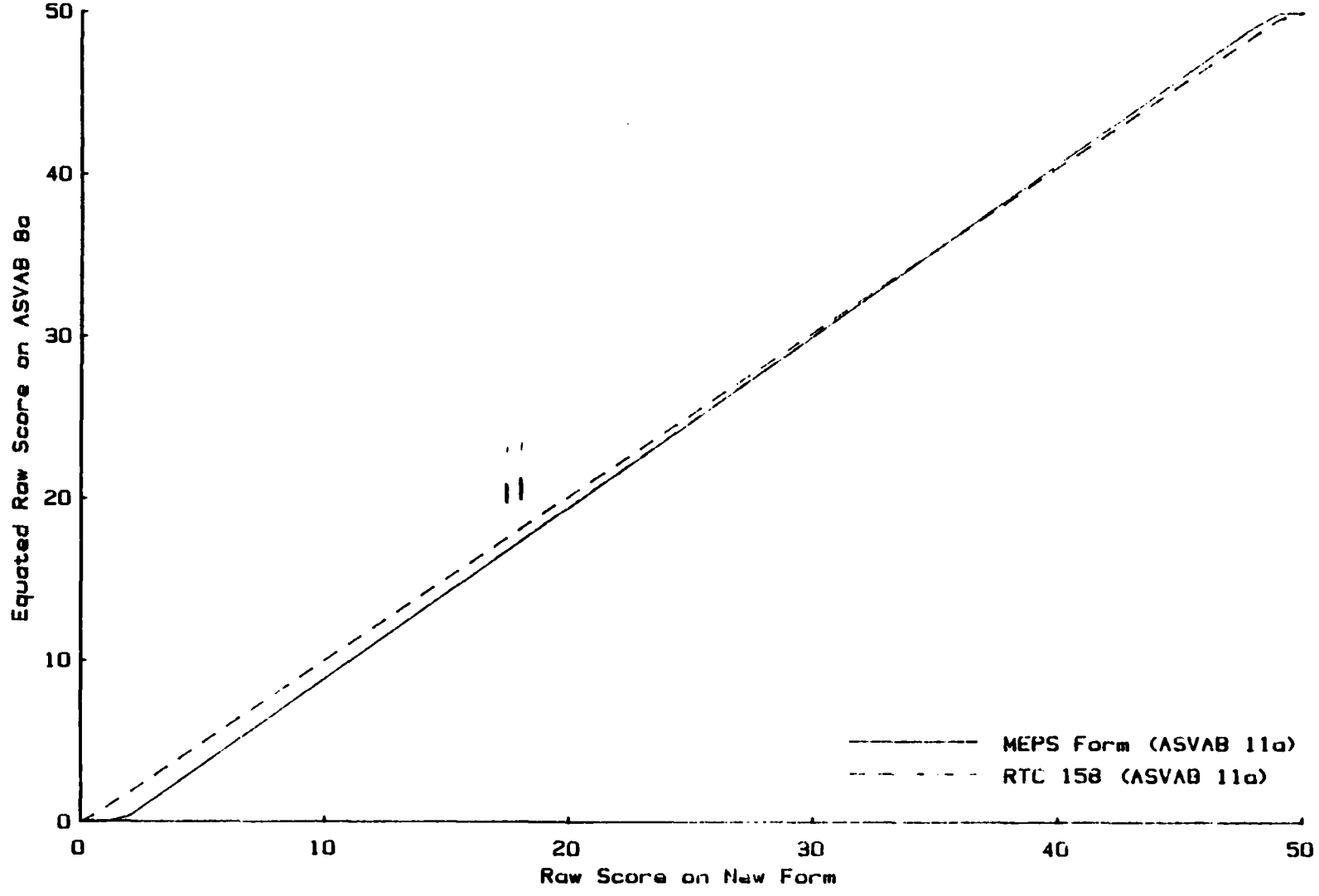

Figure B-5. Linear Equating Transformations for Raw Numerical Operations Scores.

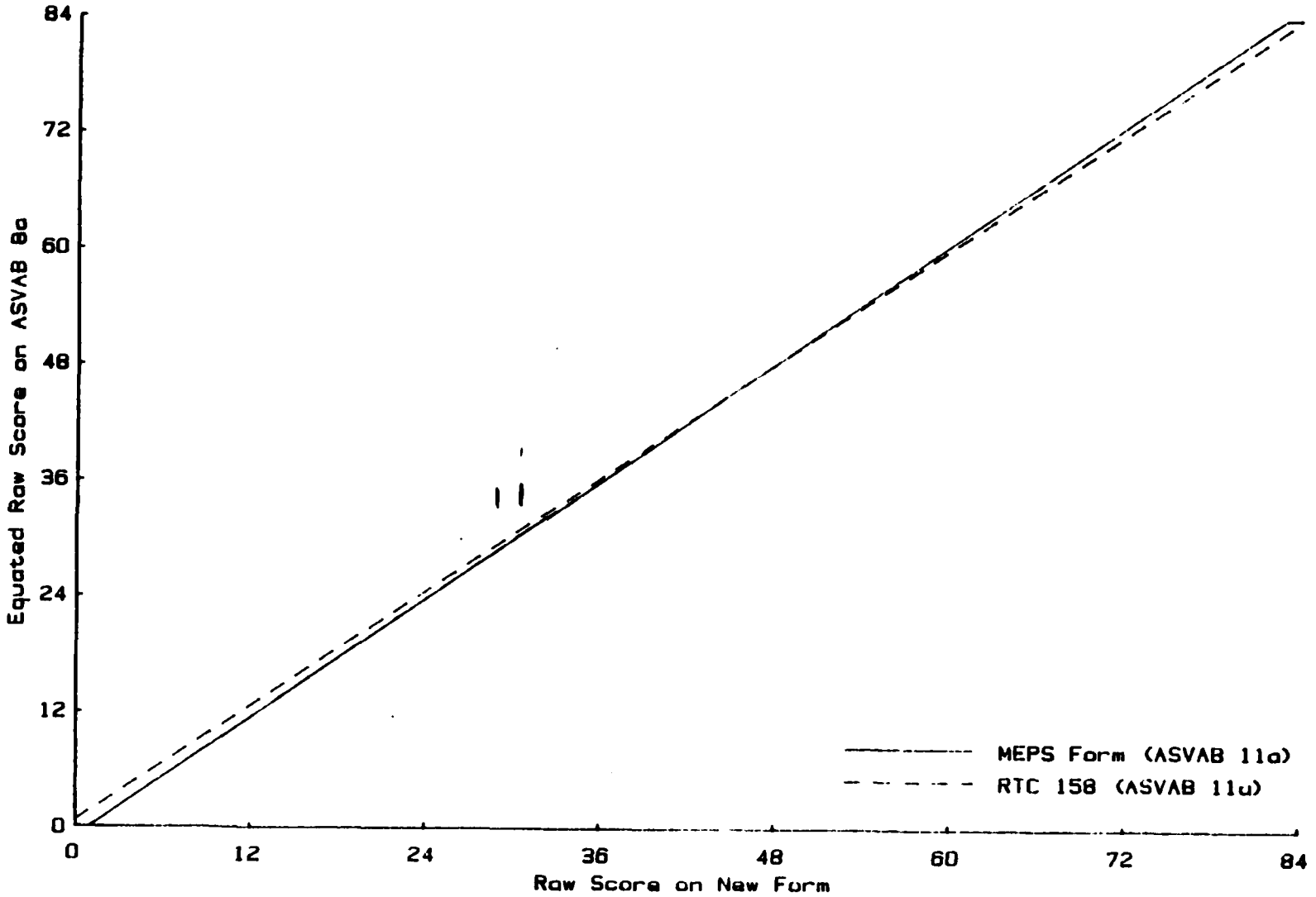

Figure B-6. Linear Equating Transformations for Raw Coding Speed Scores.

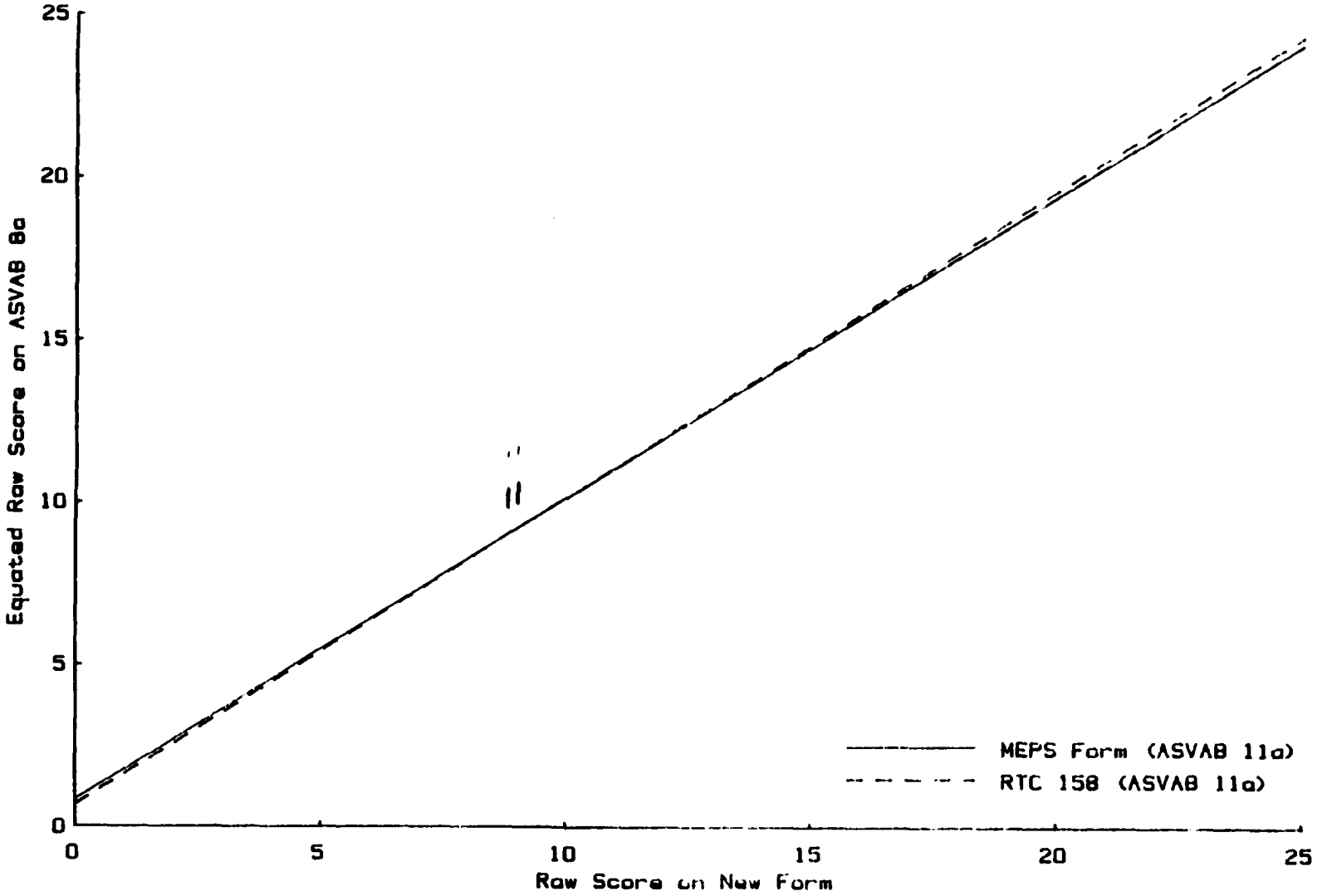

Figure B-7. Linear Equating Transformations for Raw Auto & Shop Information Scores.

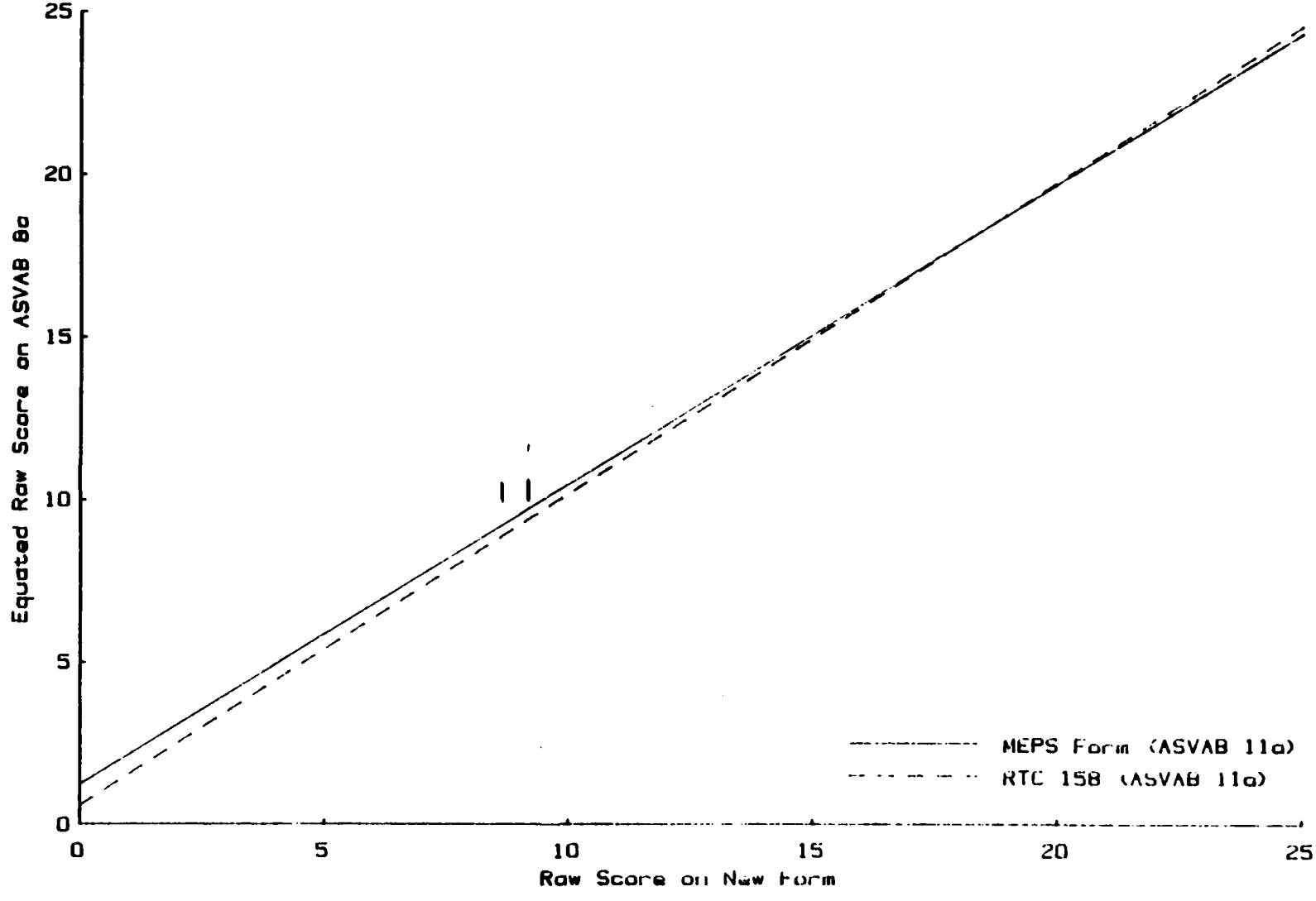

Figure B-8. Linear Equating Transformations for Raw Mathematics Knowledge Scores.

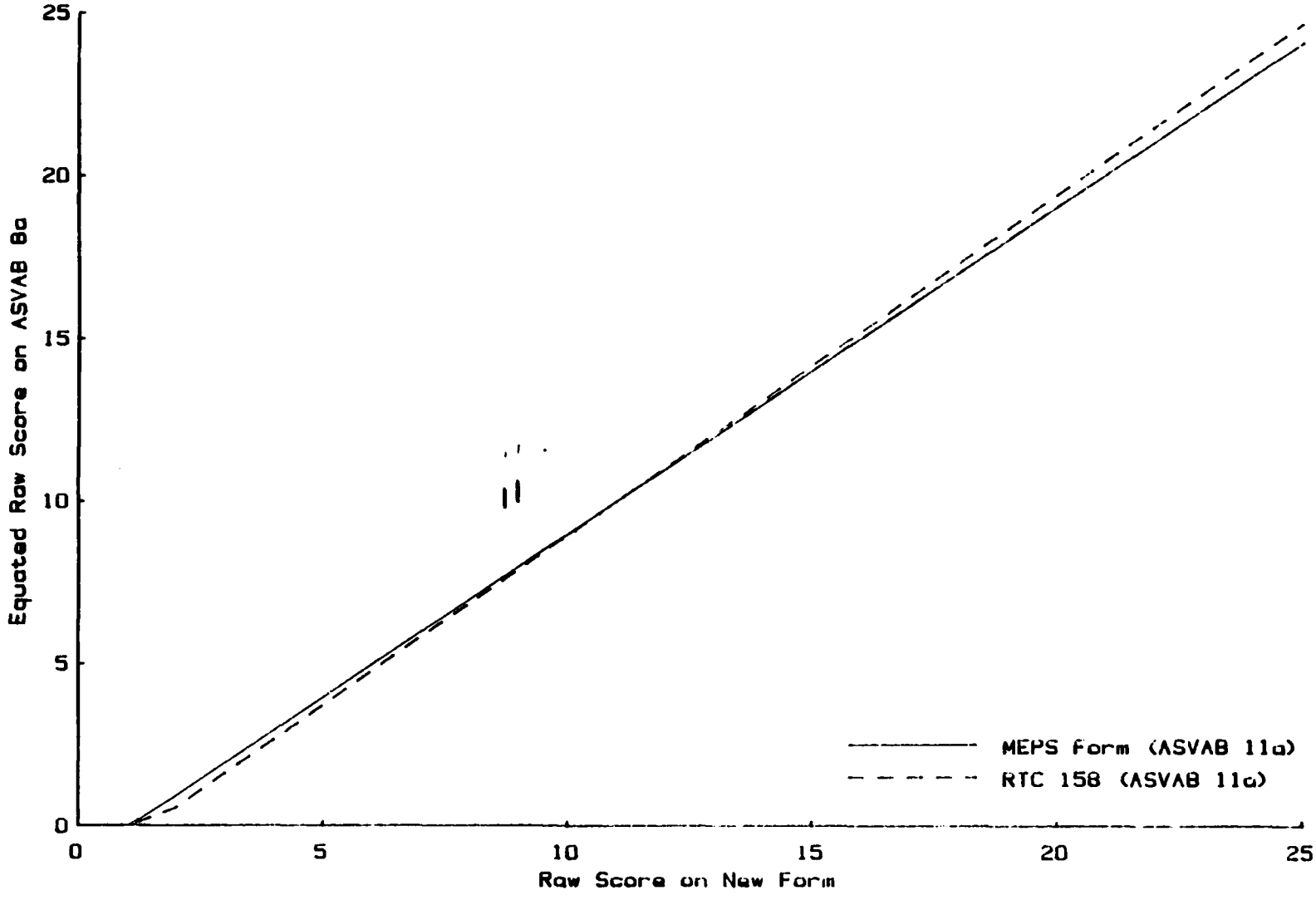

Figure B-9. Linear Equating Transformations for Raw Mechanical Comprehension Scores.

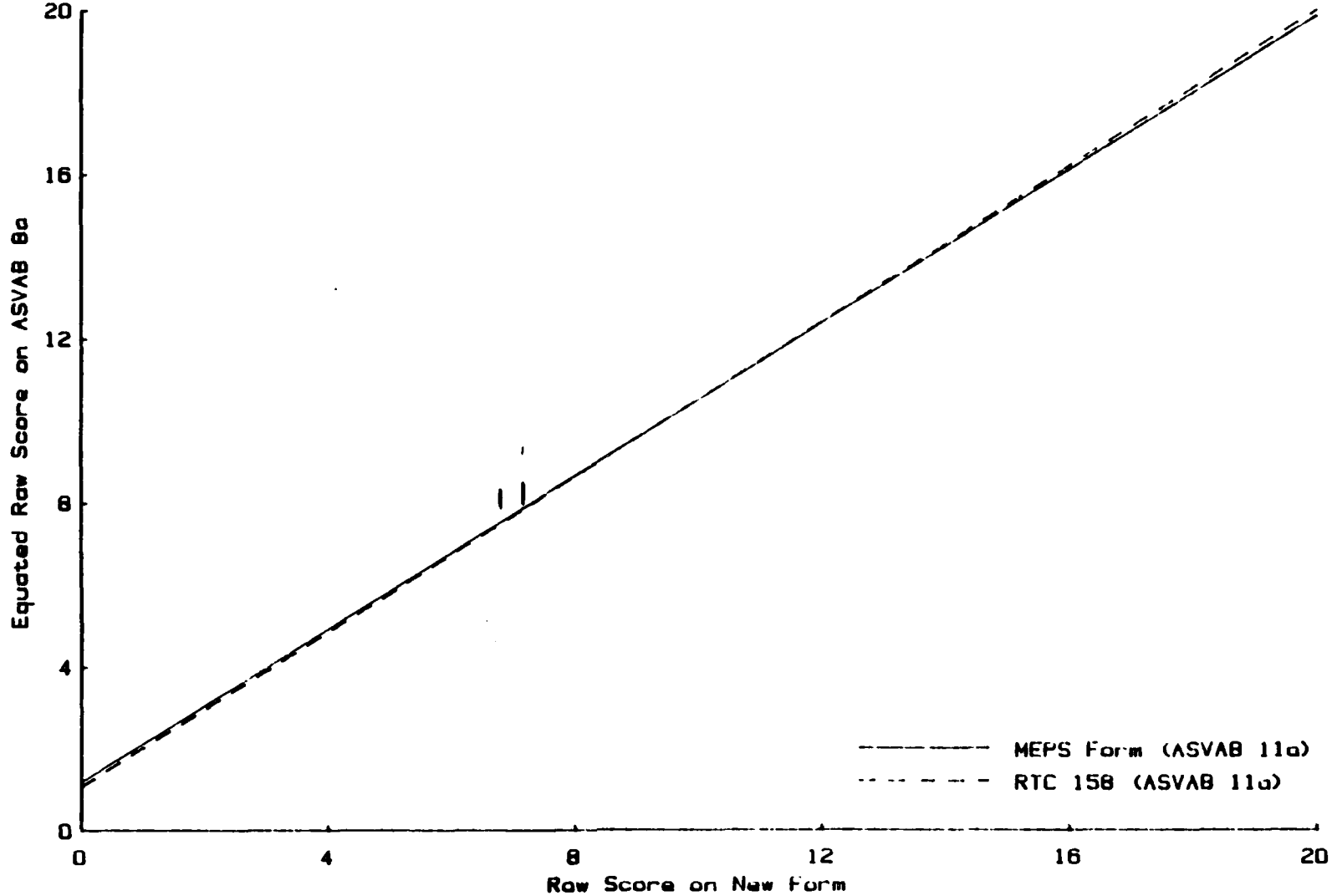

Figure B-10. Linear Equating Transformations for Raw Electronics Information Scores.

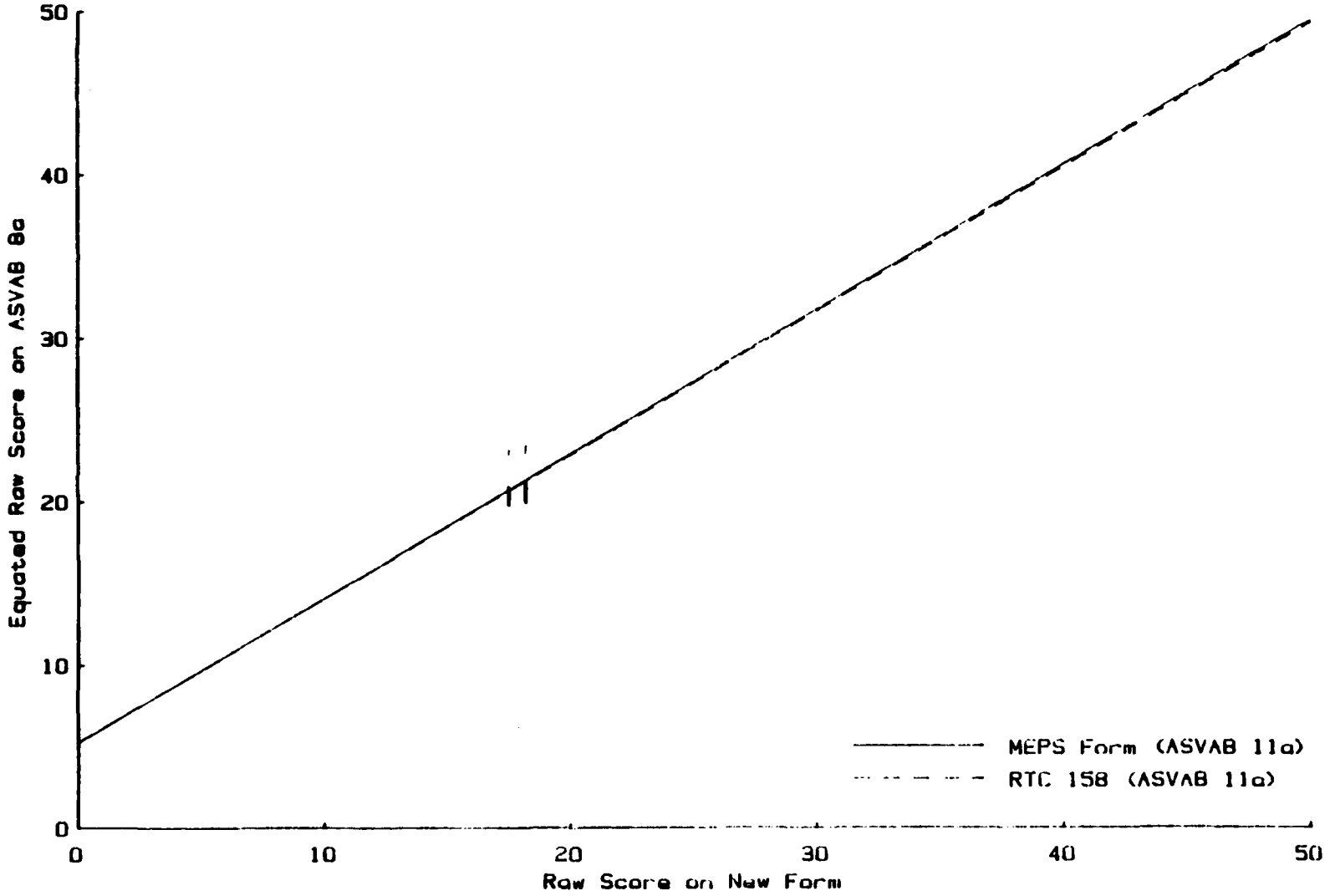

Figure B-11. Linear Equating Transformations for Raw Verbal Composite Scores.

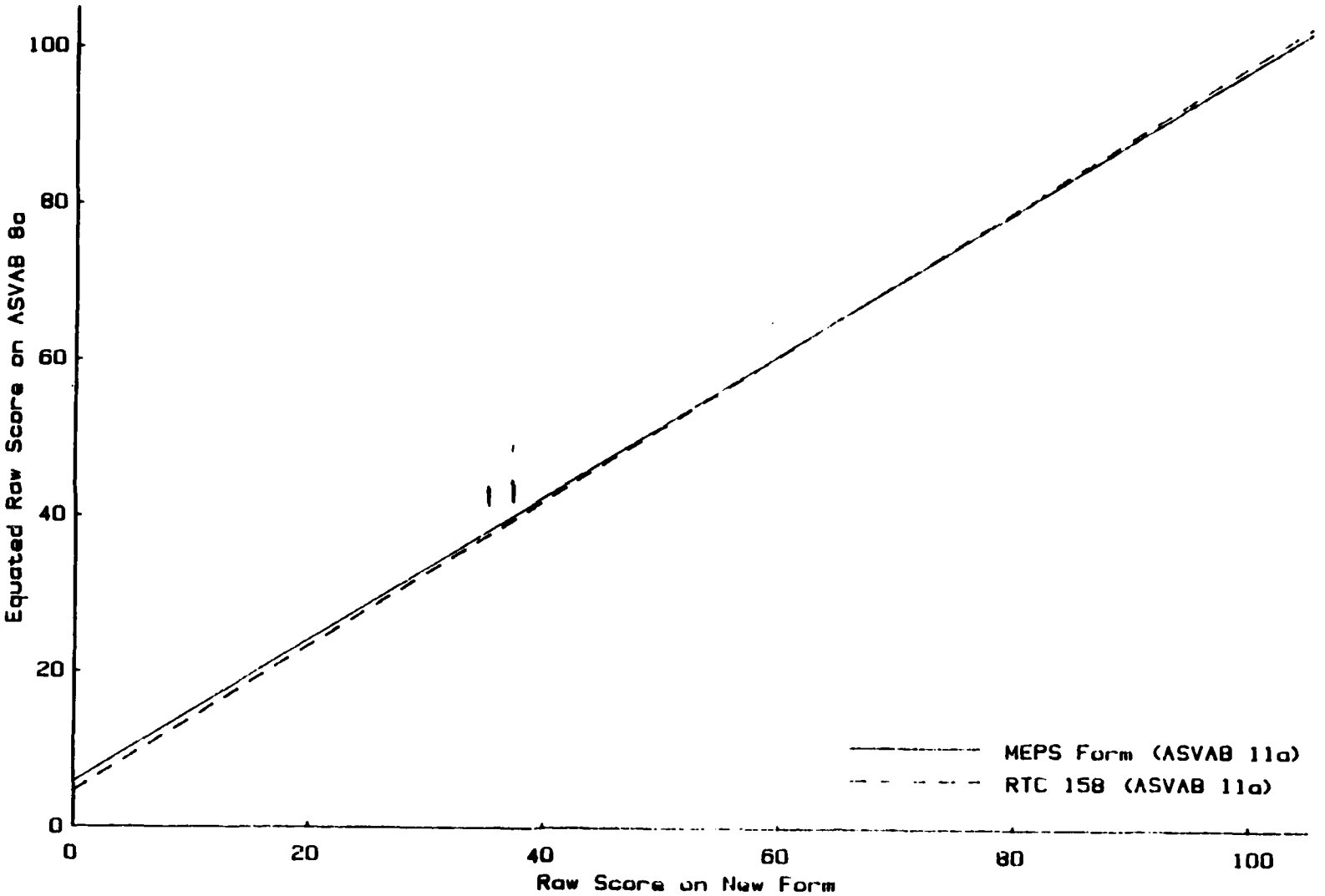

Figure B-12. Linear Equating Transformations for Raw AFQT Composite Scores.

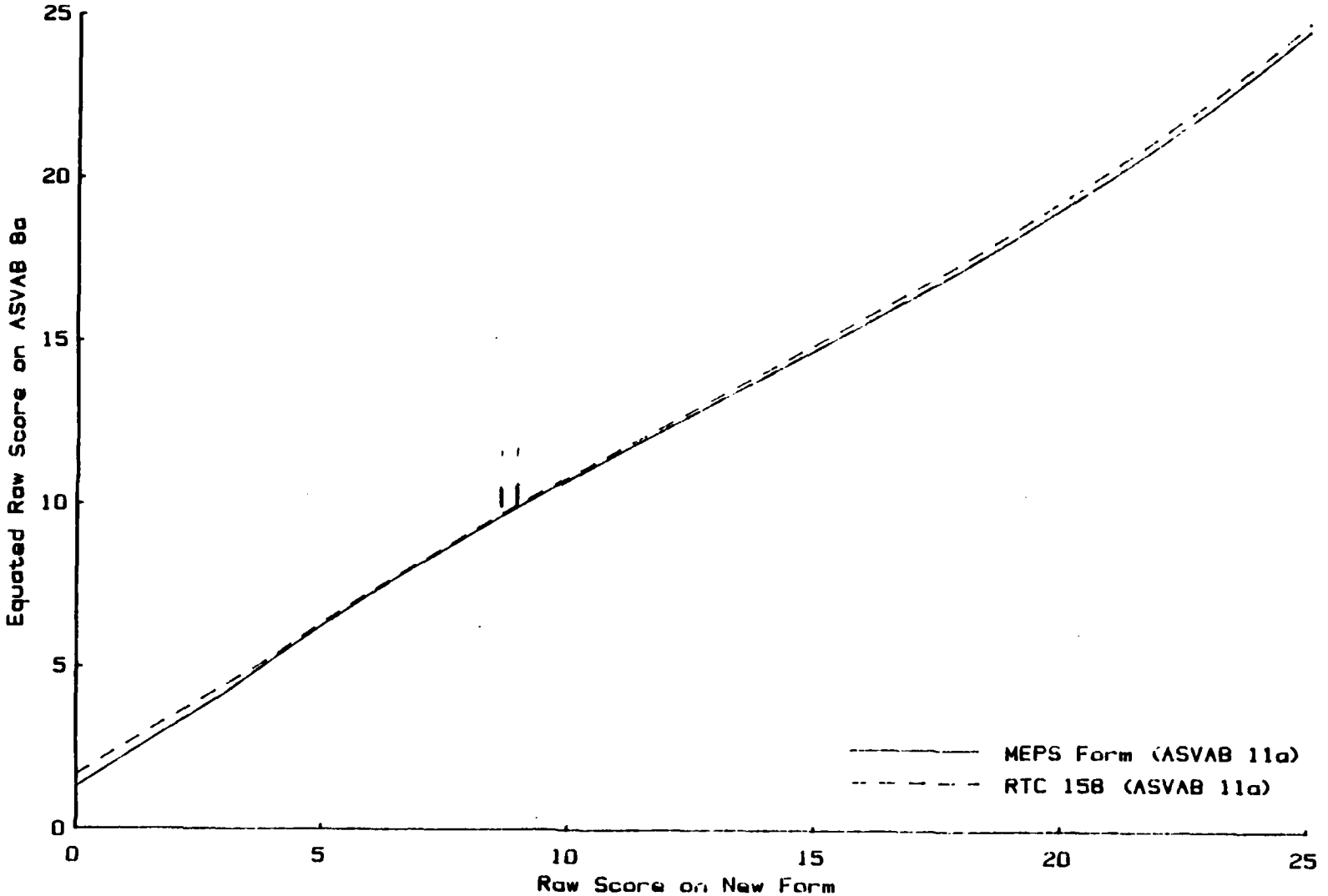

Figure B-13. Smoothed Equipercentile Equating Transformations for Raw General Science Scores.

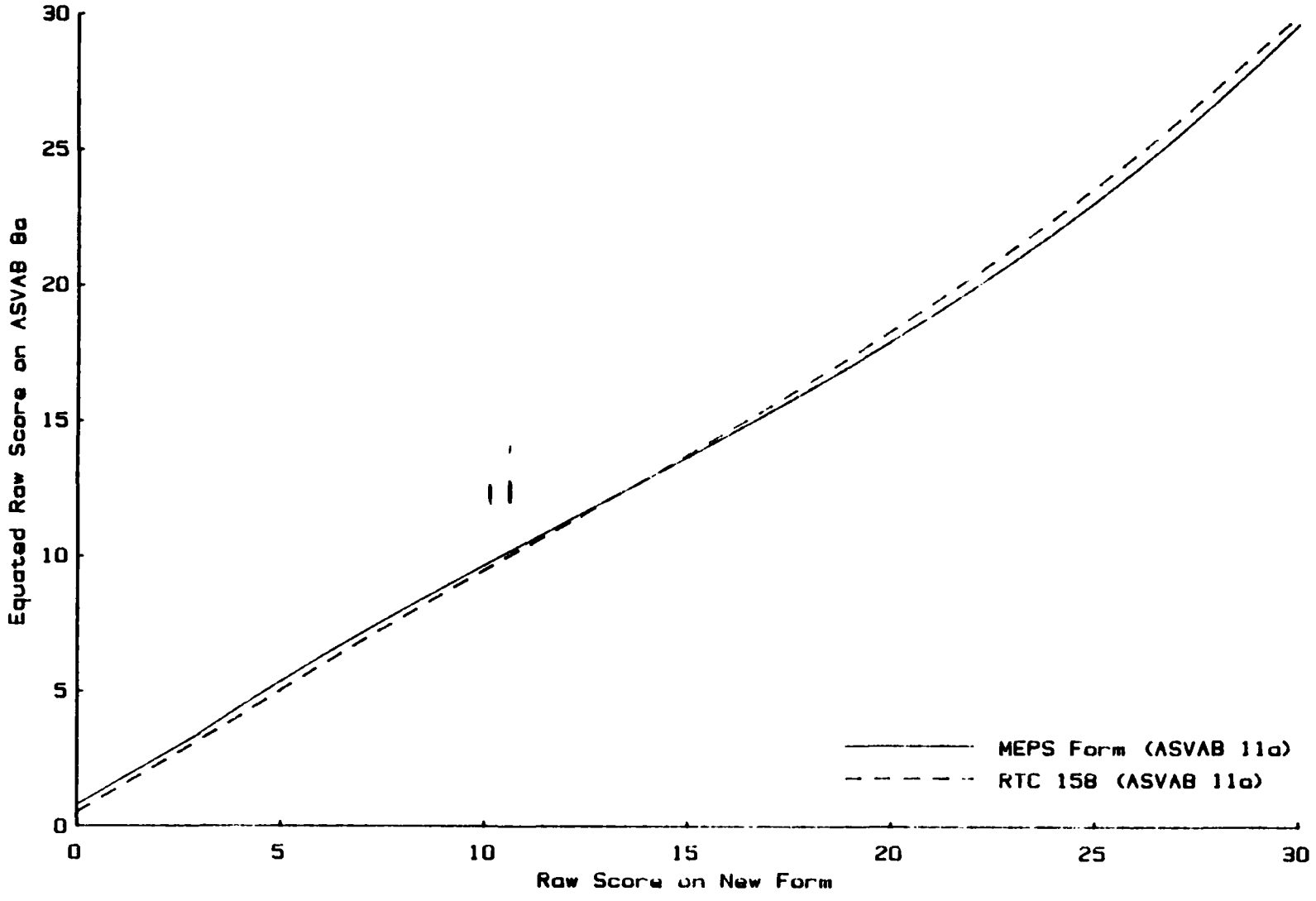

Figure B-14. Smoothed Equipercentile Equating Transformations for Raw Arithmetic Reasoning Scores.

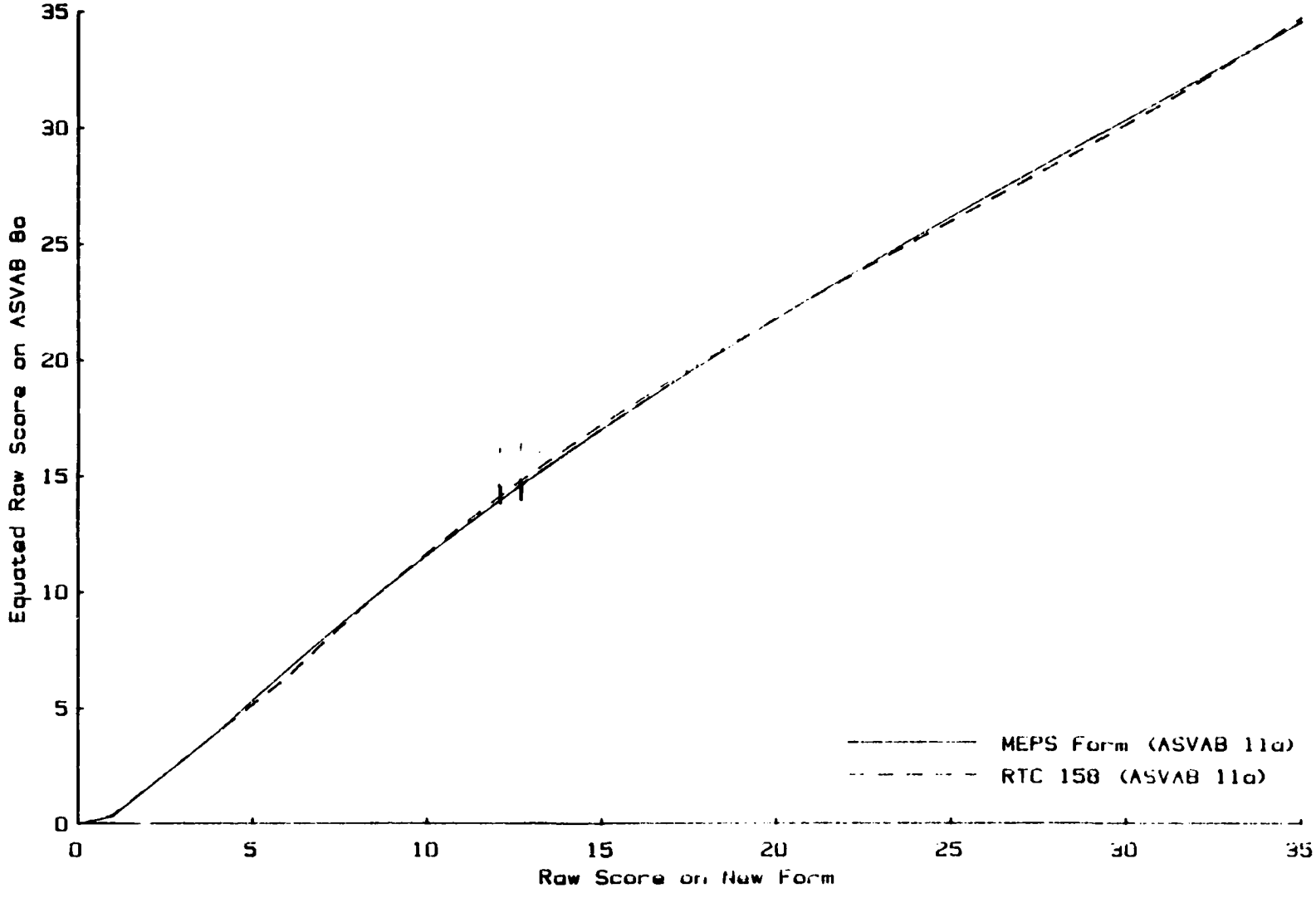

Figure B-15. Smoothed Equipercentile Equating Transformations for Raw Word Knowledge Scores.

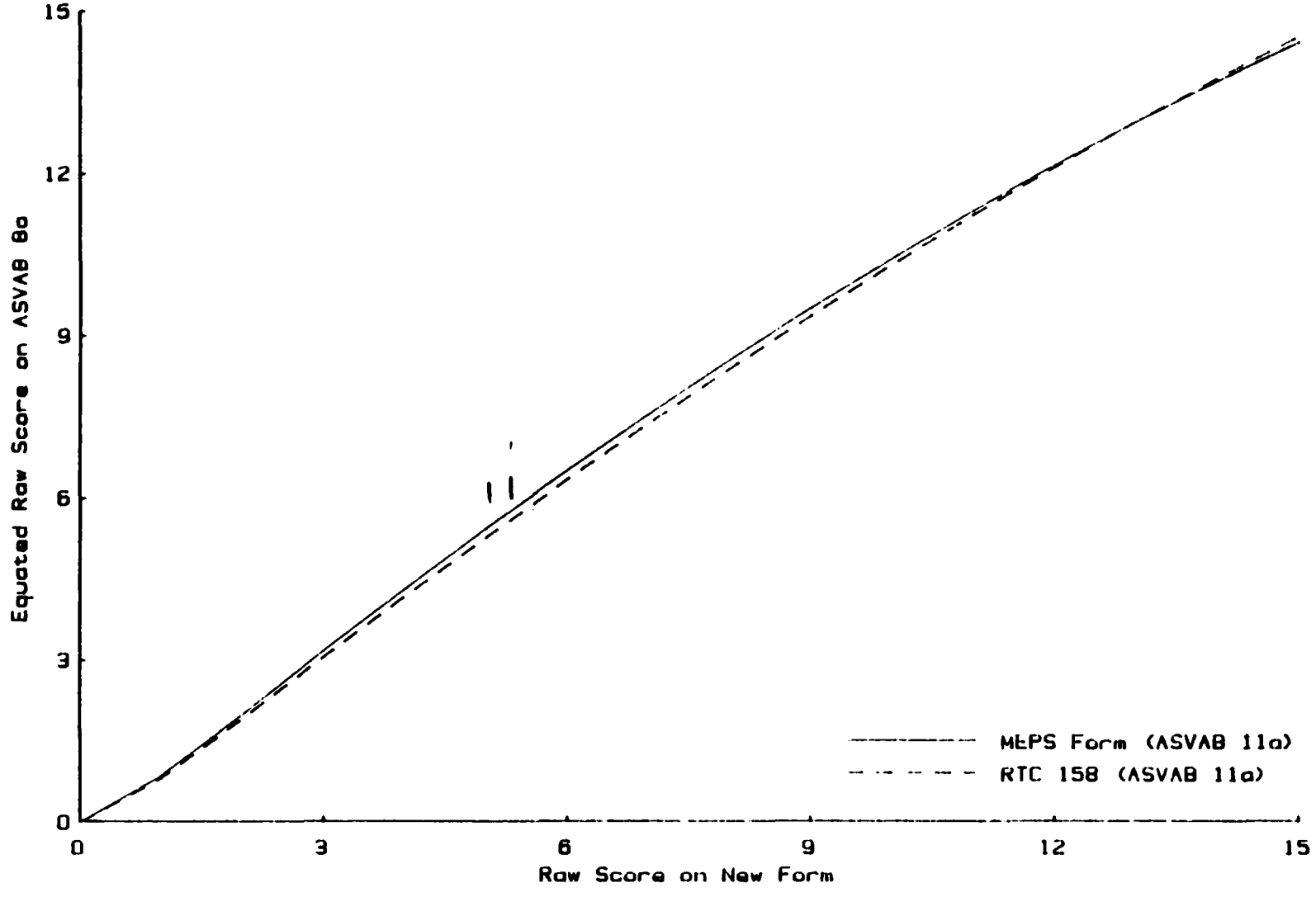

Figure B-16. Smoothed Equipercentile Equating Transformations for Raw Paragraph Comprehension Scores.

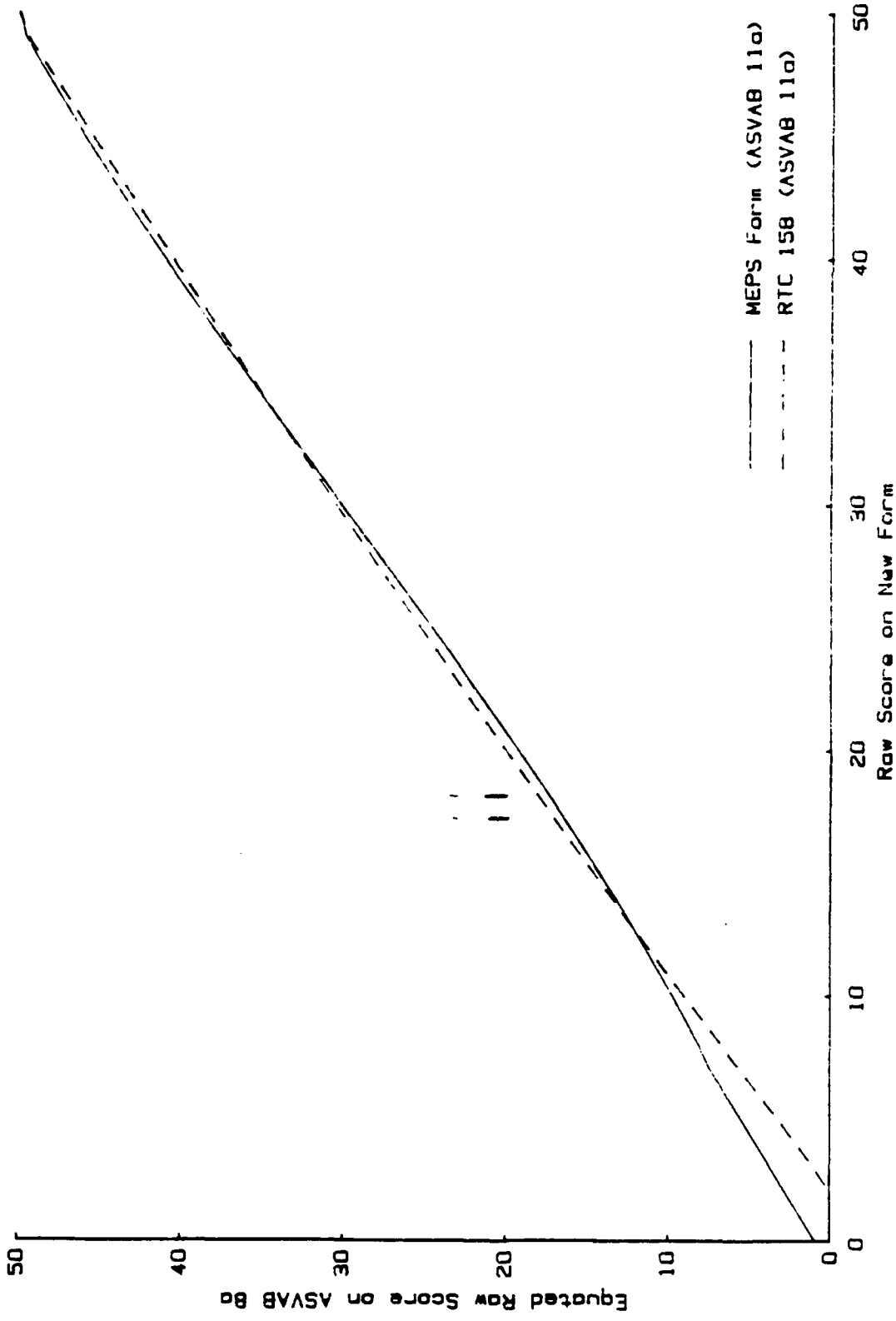

Figure B-17. Smoothed Equipercentile Equating Transformations for Raw Numerical Operations Scores.

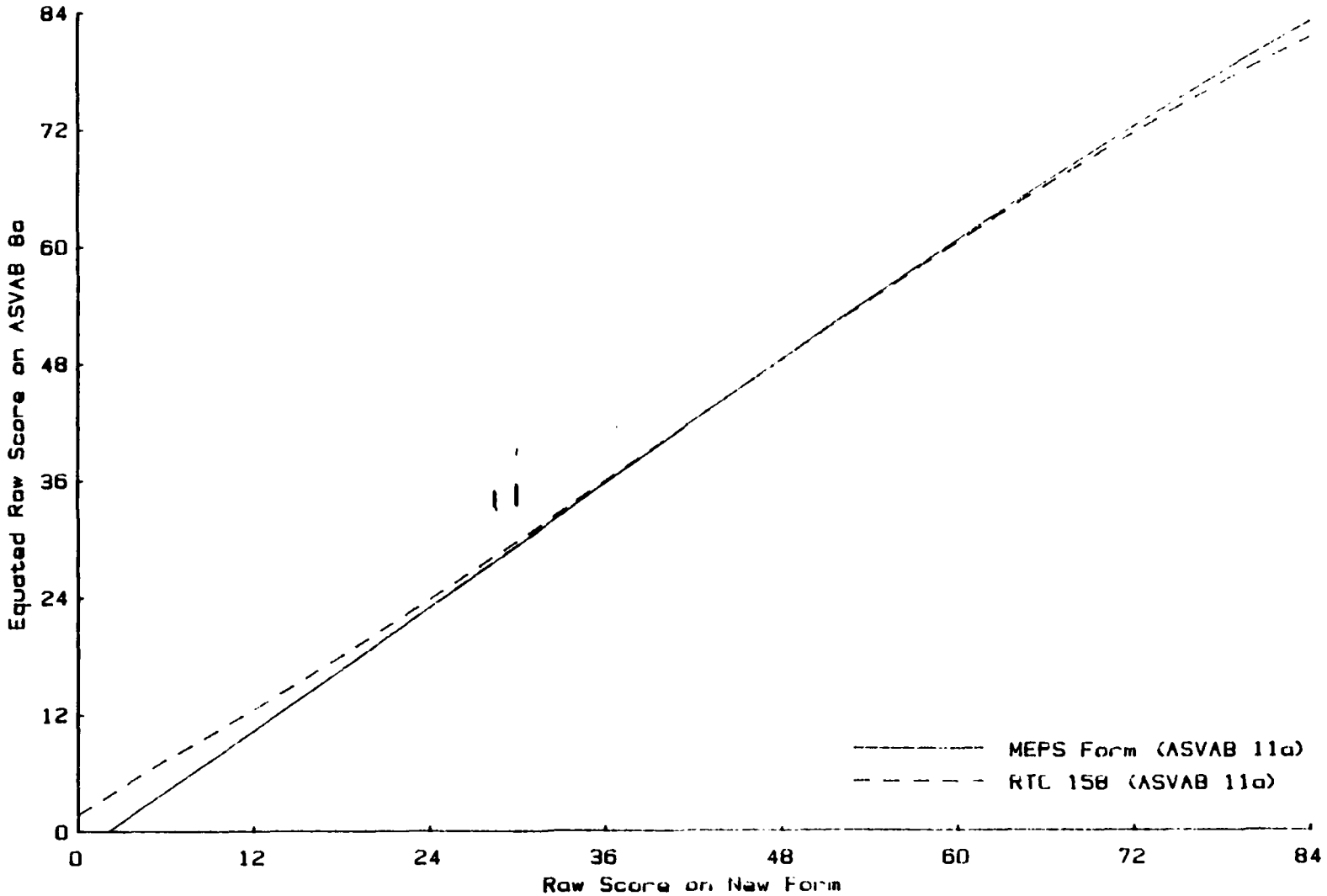

Figure B-18. Smoothed Equipercentile Equating Transformations for Raw Coding Speed Scores.

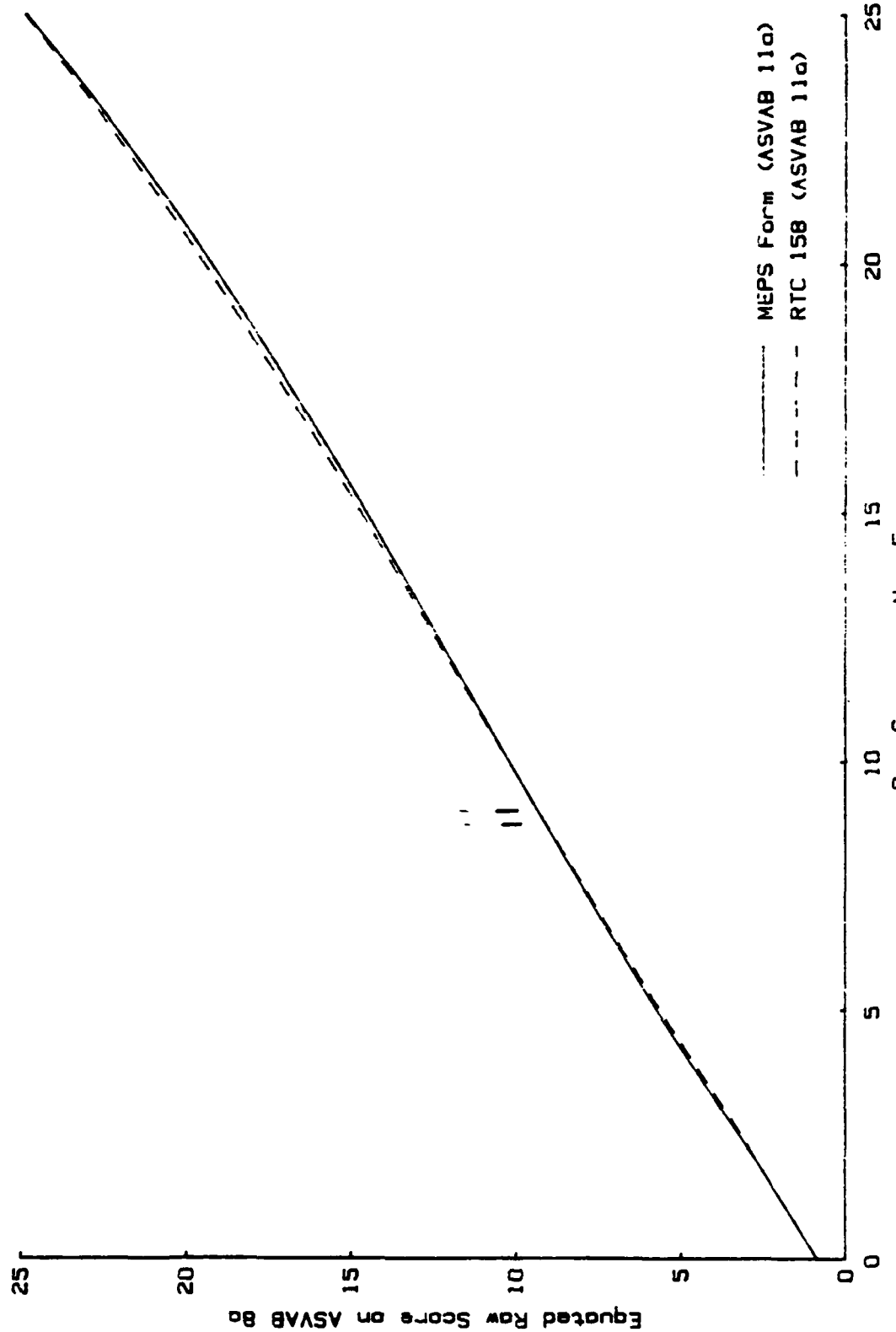

Figure B-19. Smoothed Equipercentile Equating Transformations for Raw Auto & Shop Information Scores.

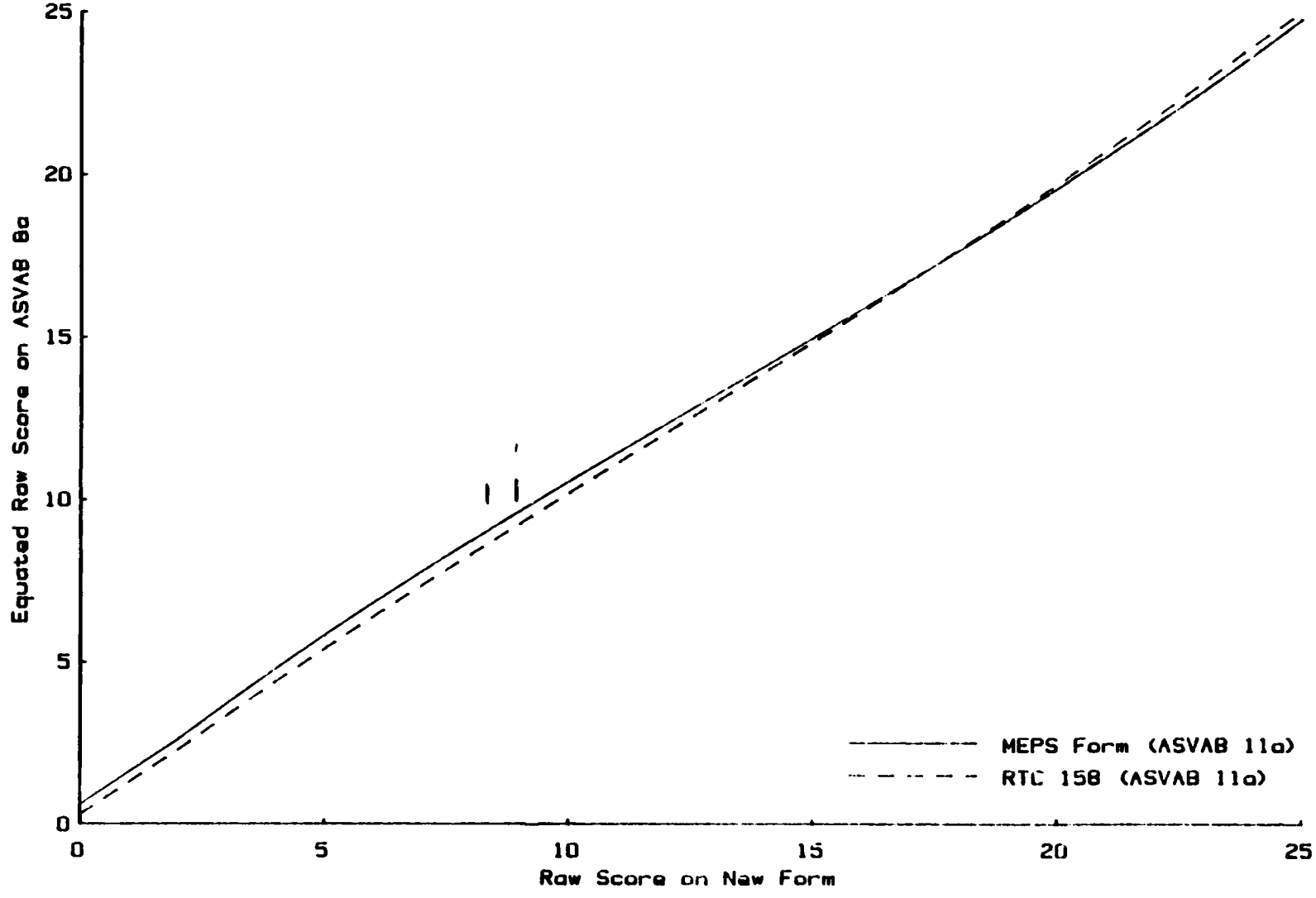

Figure B-20. Smoothed Equipercentile Equating Transformations for Raw Mathematics Knowledge Scores.

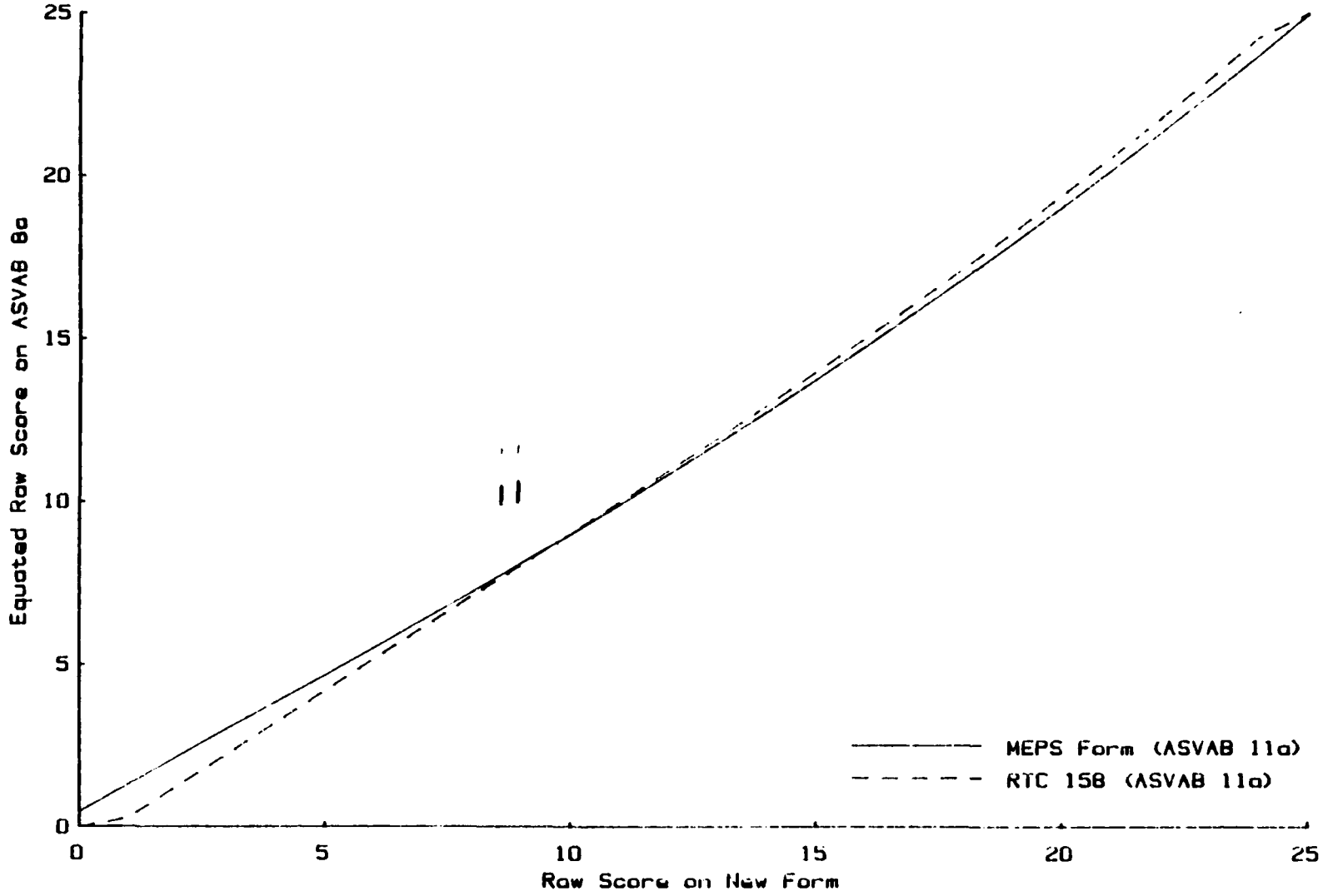

Figure B-21. Smoothed Equipercentile Equating Transformations for Raw Mechanical Comprehension Scores.

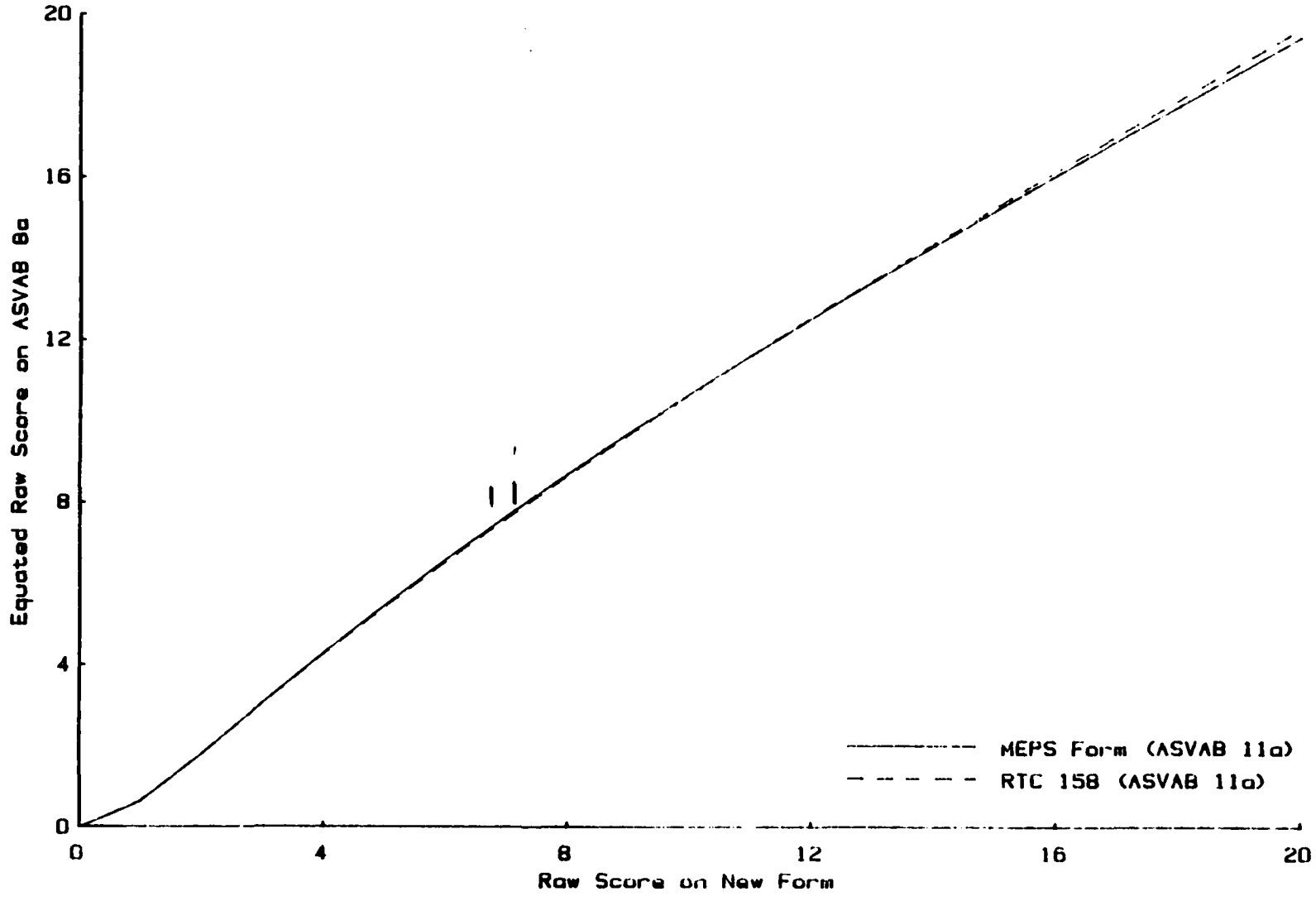

Figure B-22. Smoothed Equipercentile Equating Transformations for Raw Electronics Information Scores.

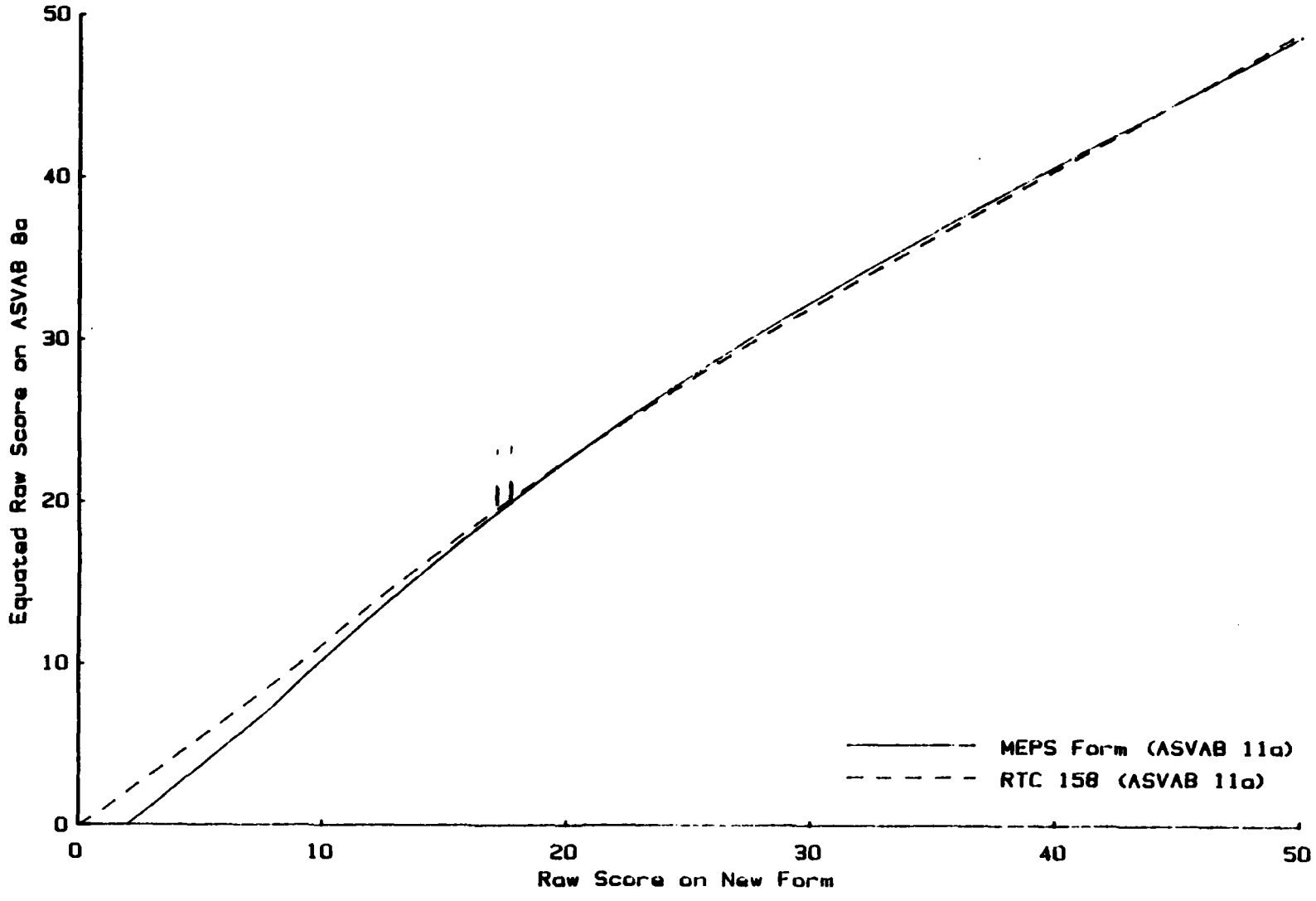

Figure B-23. Smoothed Equipercentile Equating Transformations for Raw Verbal Composite Scores.

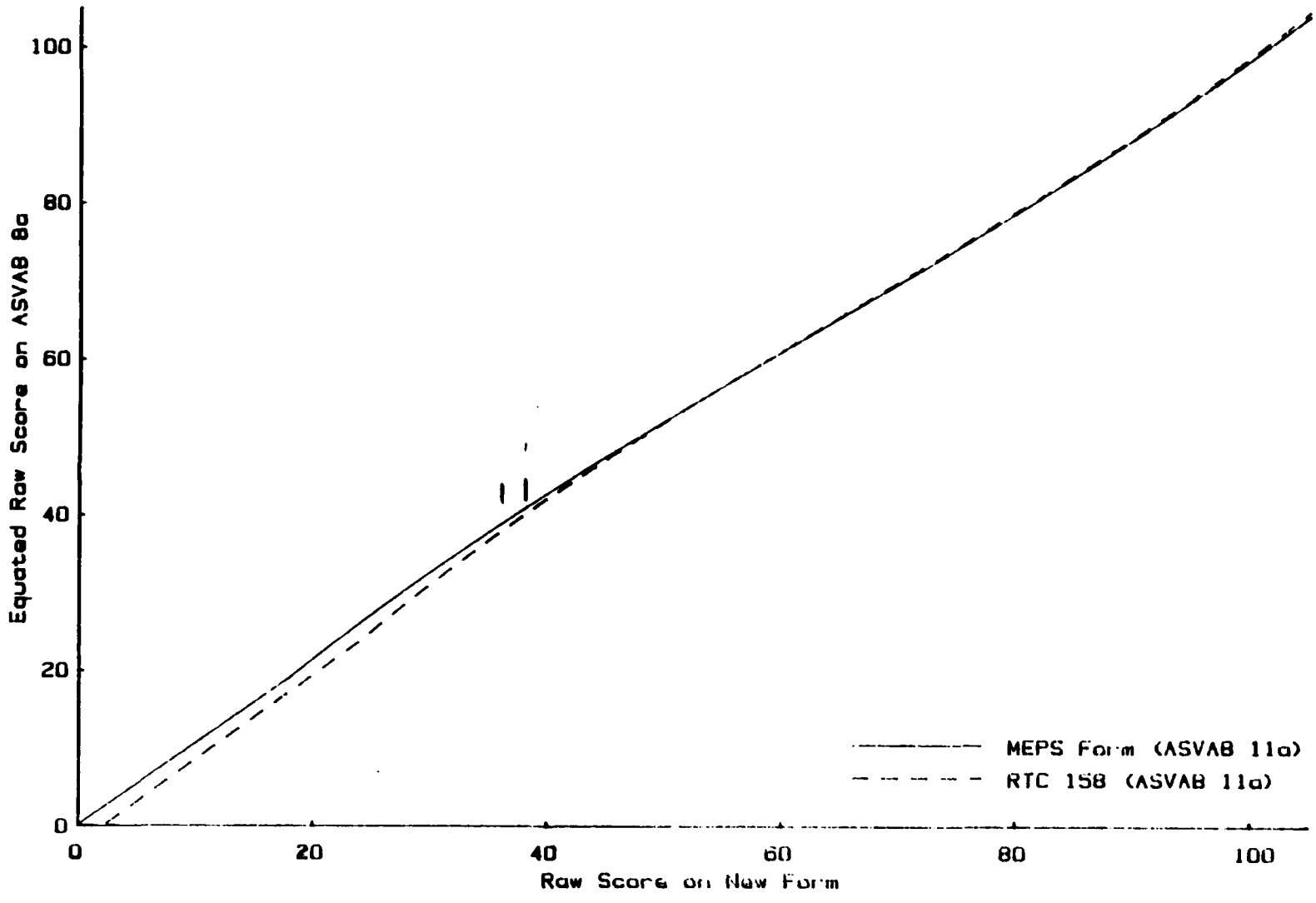

Figure B-24. Smoothed Equipercentile Equating Transformations for Raw AFQT Composite Scores.

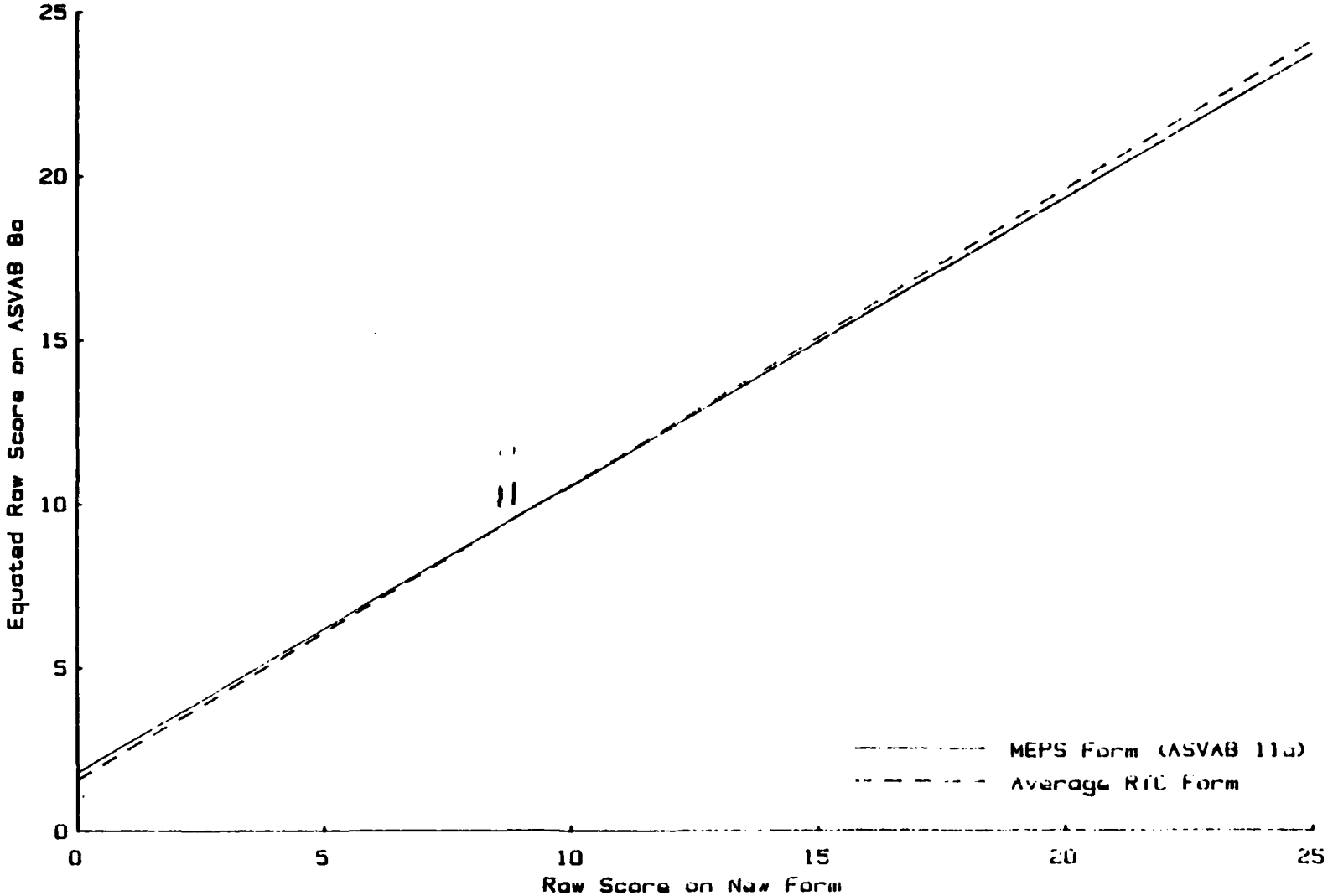

Figure B-25. Linear Equating Transformations for Raw General Science Scores.

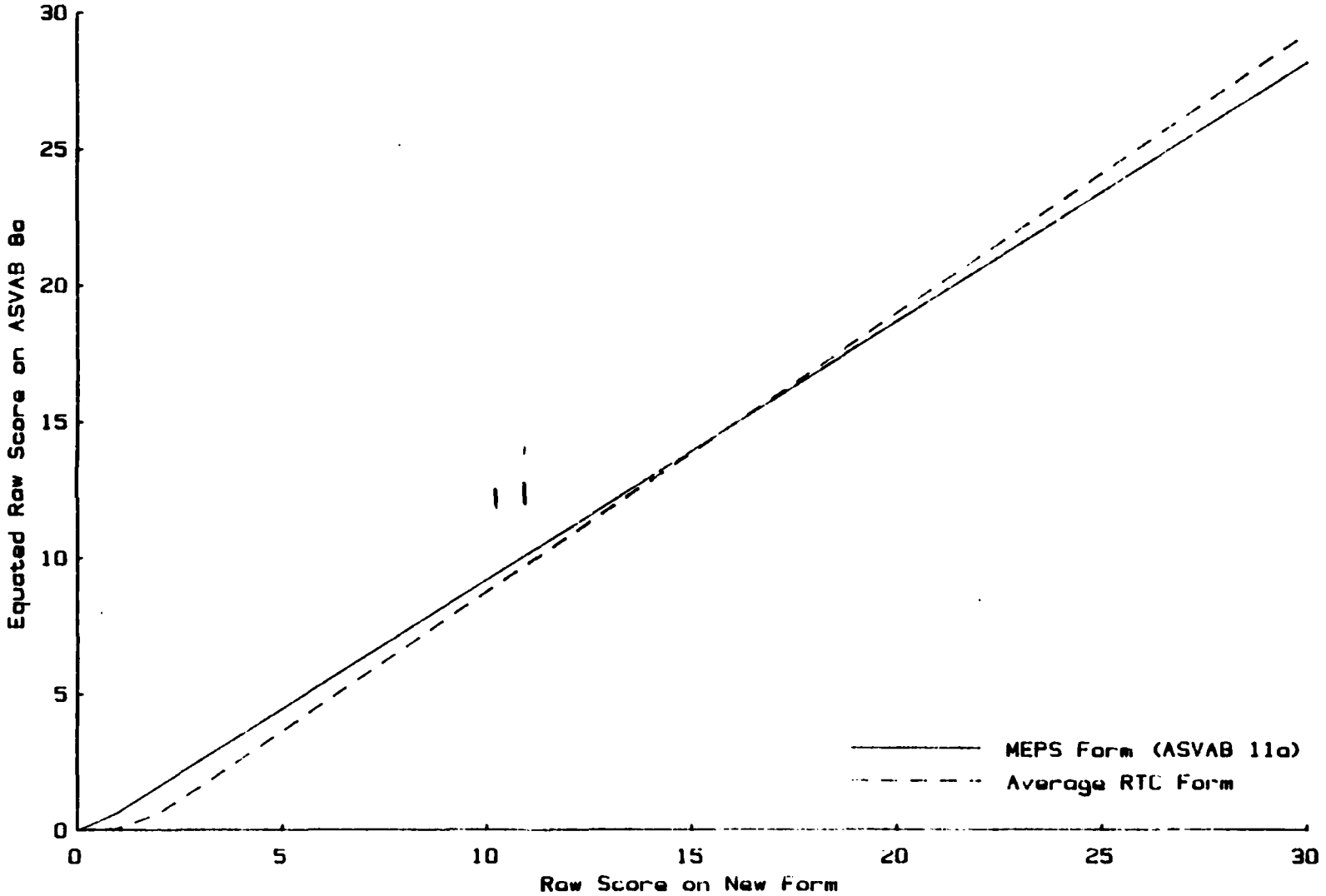

Figure B-26. Linear Equating Transformations for Raw Arithmetic Reasoning Scores.

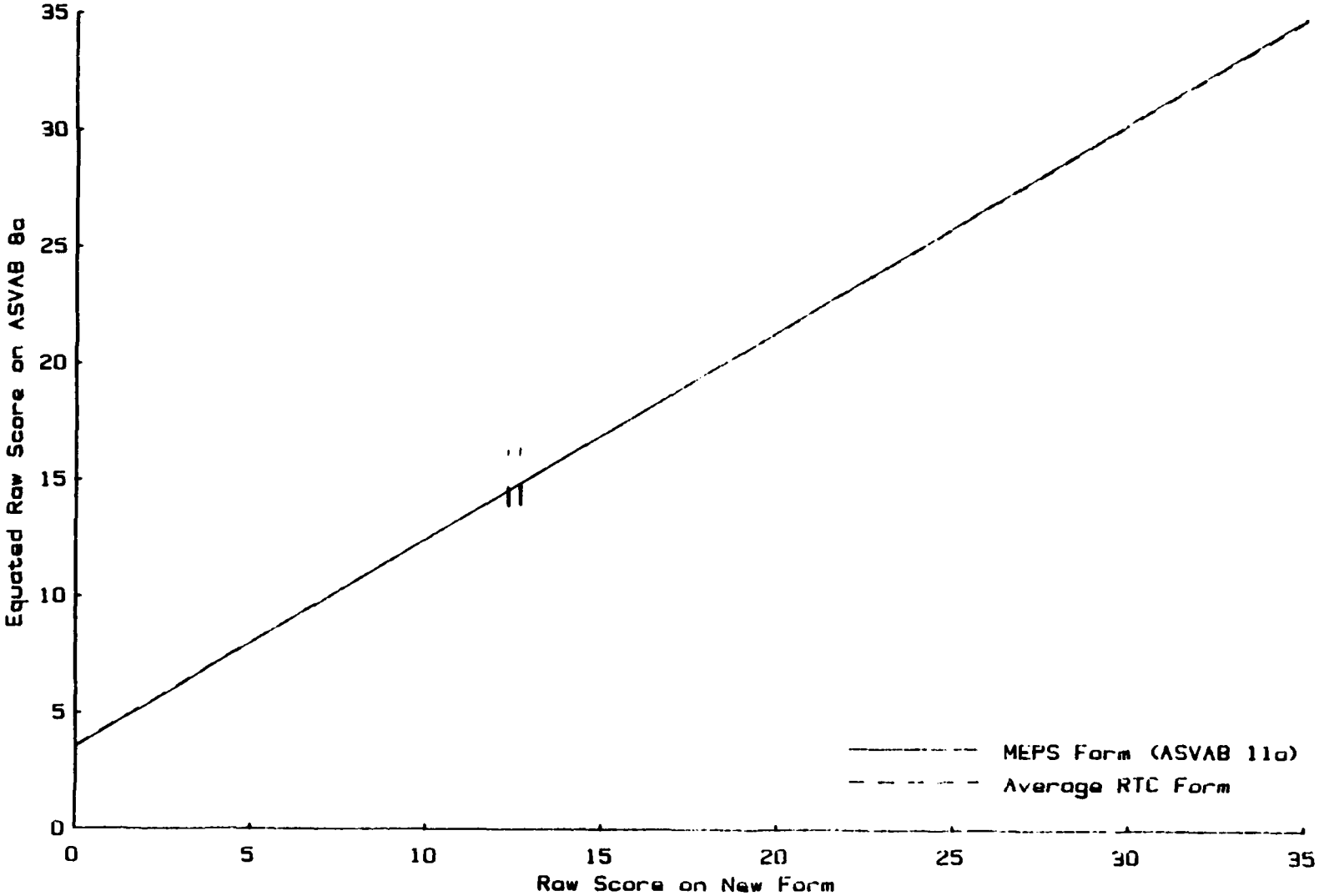

Figure B-27. Linear Equating Transformations for Raw Word Knowledge Scores.

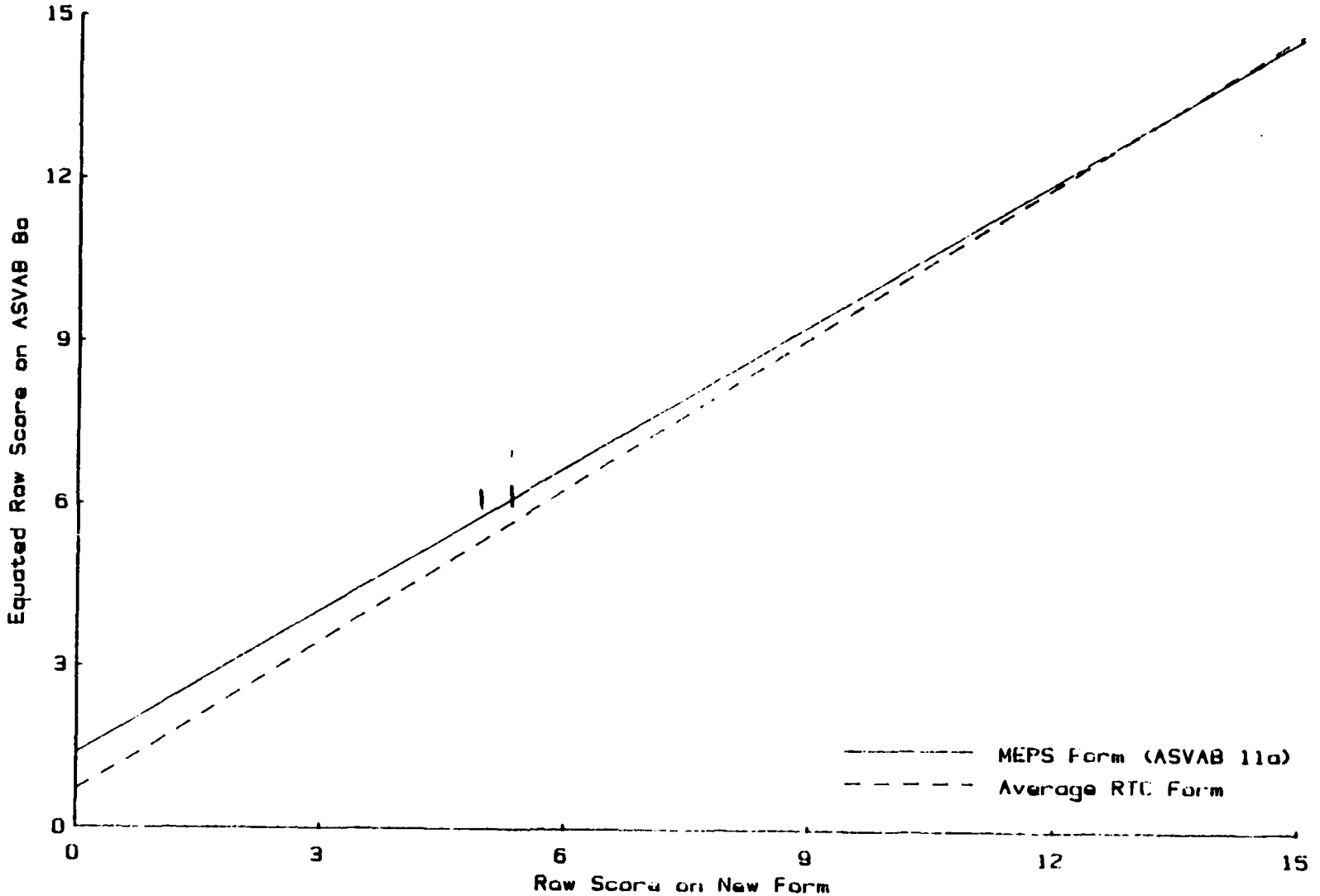

Figure B-28. Linear Equating Transformations for Raw Paragraph Comprehension Scores.

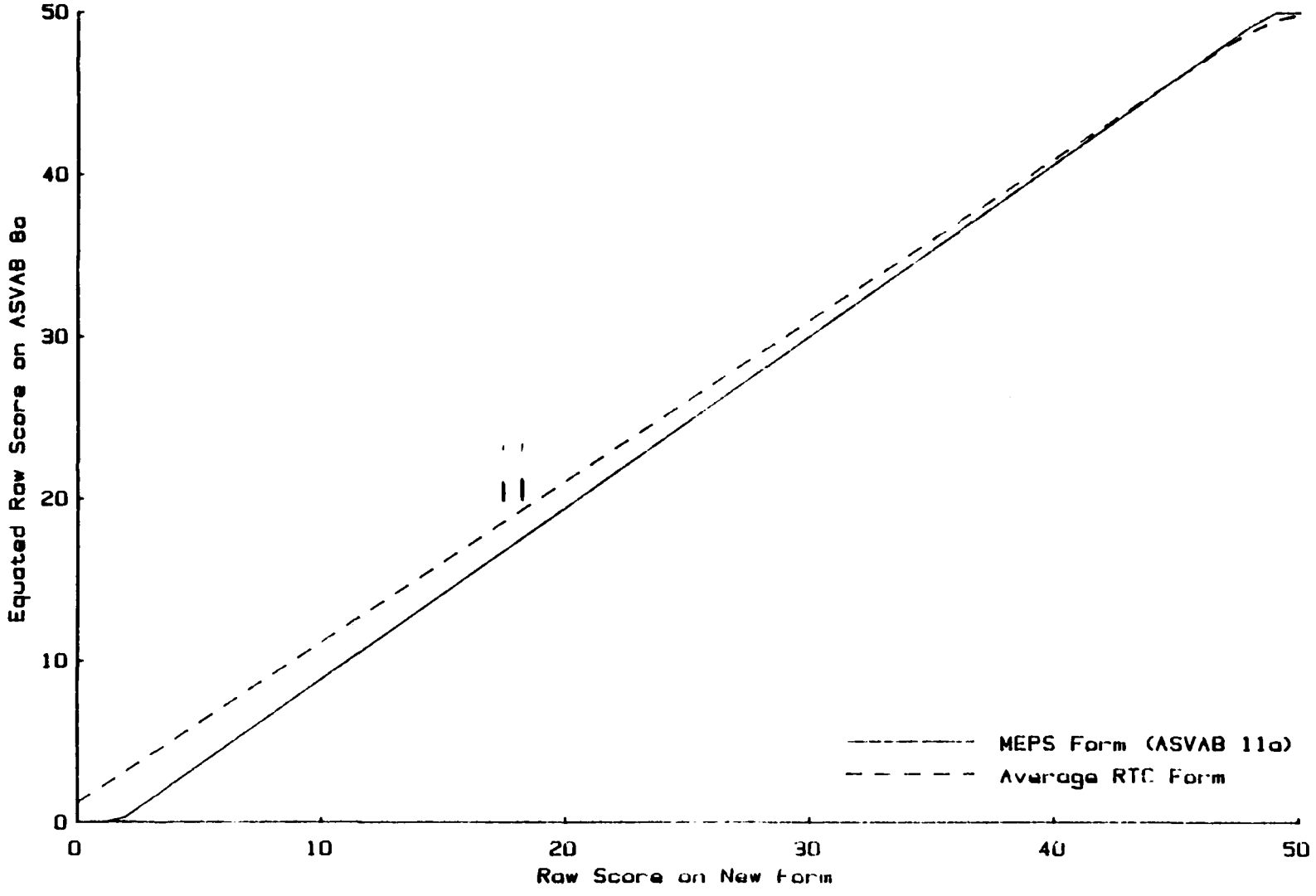

Figure B-29. Linear Equating Transformations for Raw Numerical Operations Scores.

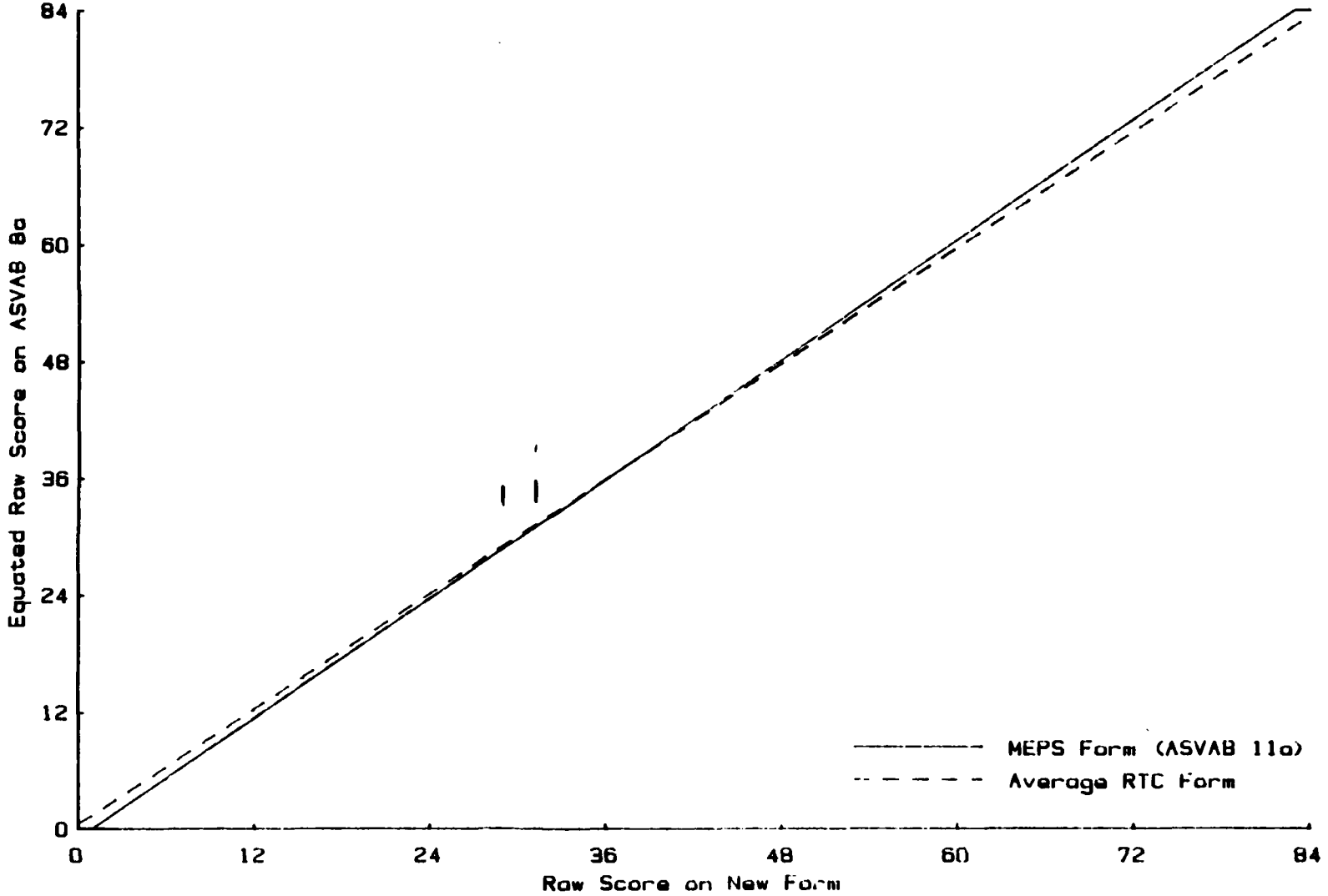

Figure B-30. Linear Equating Transformations for Raw Coding Speed Scores.

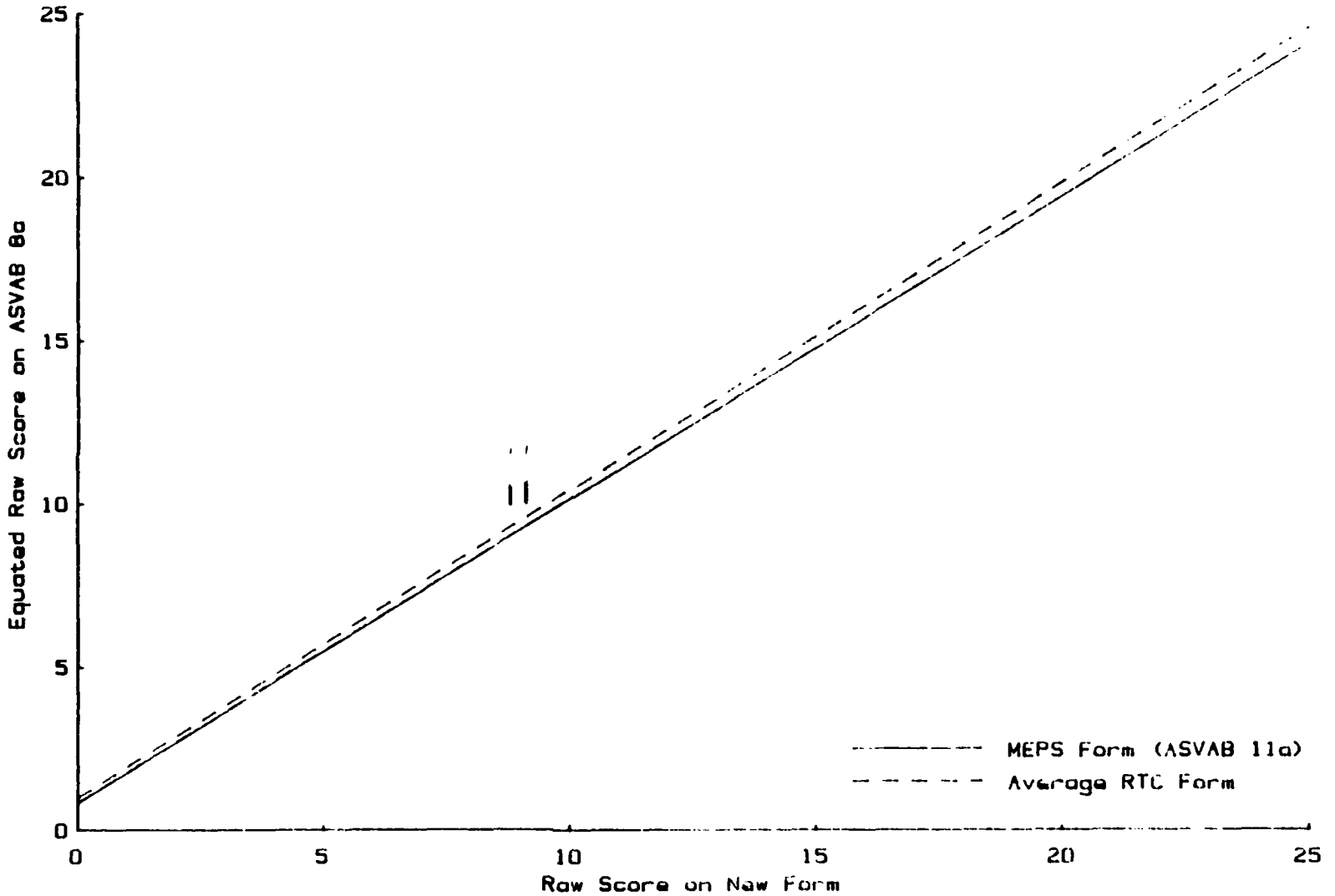

Figure B-31. Linear Equating Transformations for Raw Auto & Shop Information Scores.

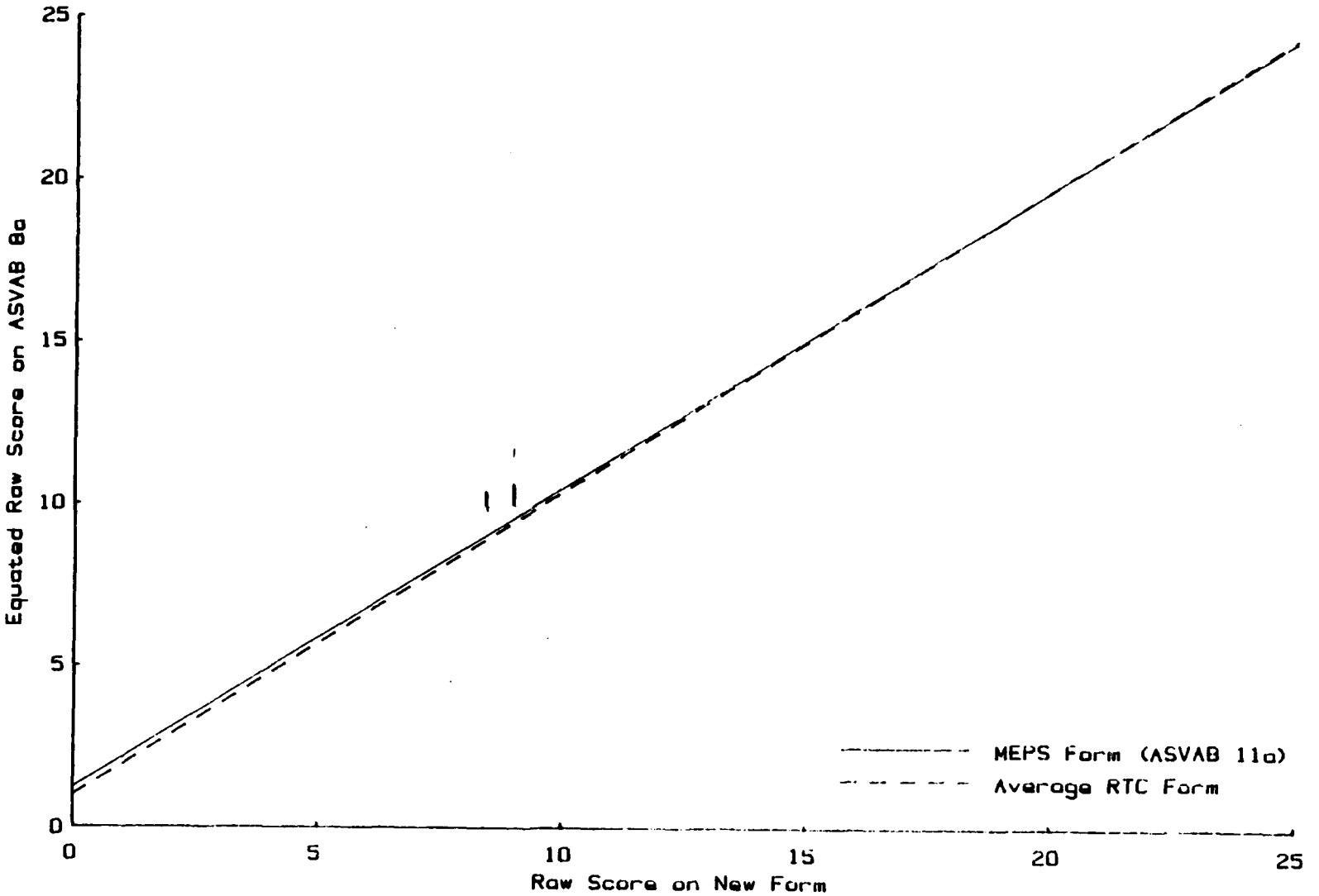

Figure B-32. Linear Equating Transformations for Raw Mathematics Knowledge Scores.

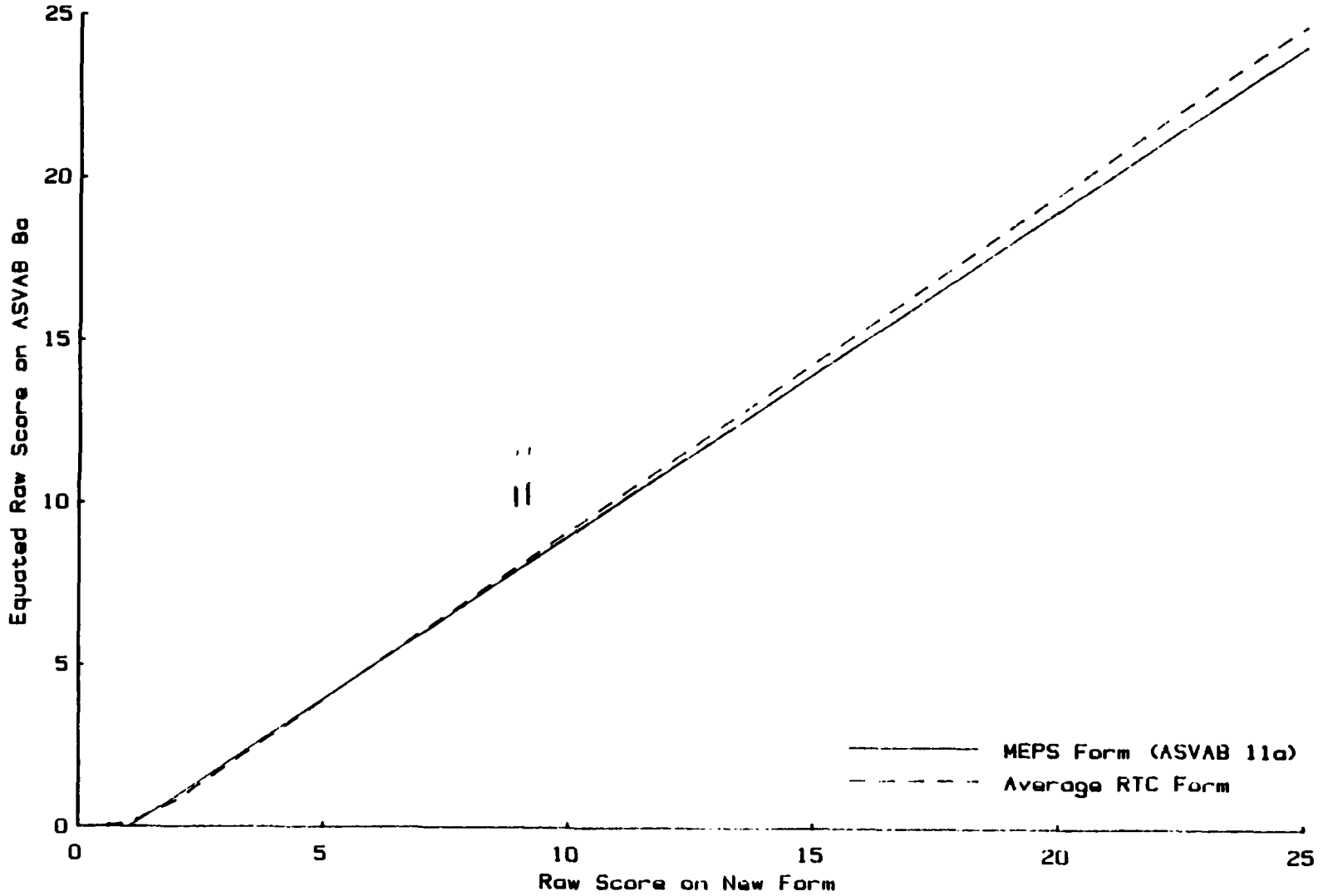

Figure 8-33. Linear Equating Transformations for Raw Mechanical Comprehension Scores.

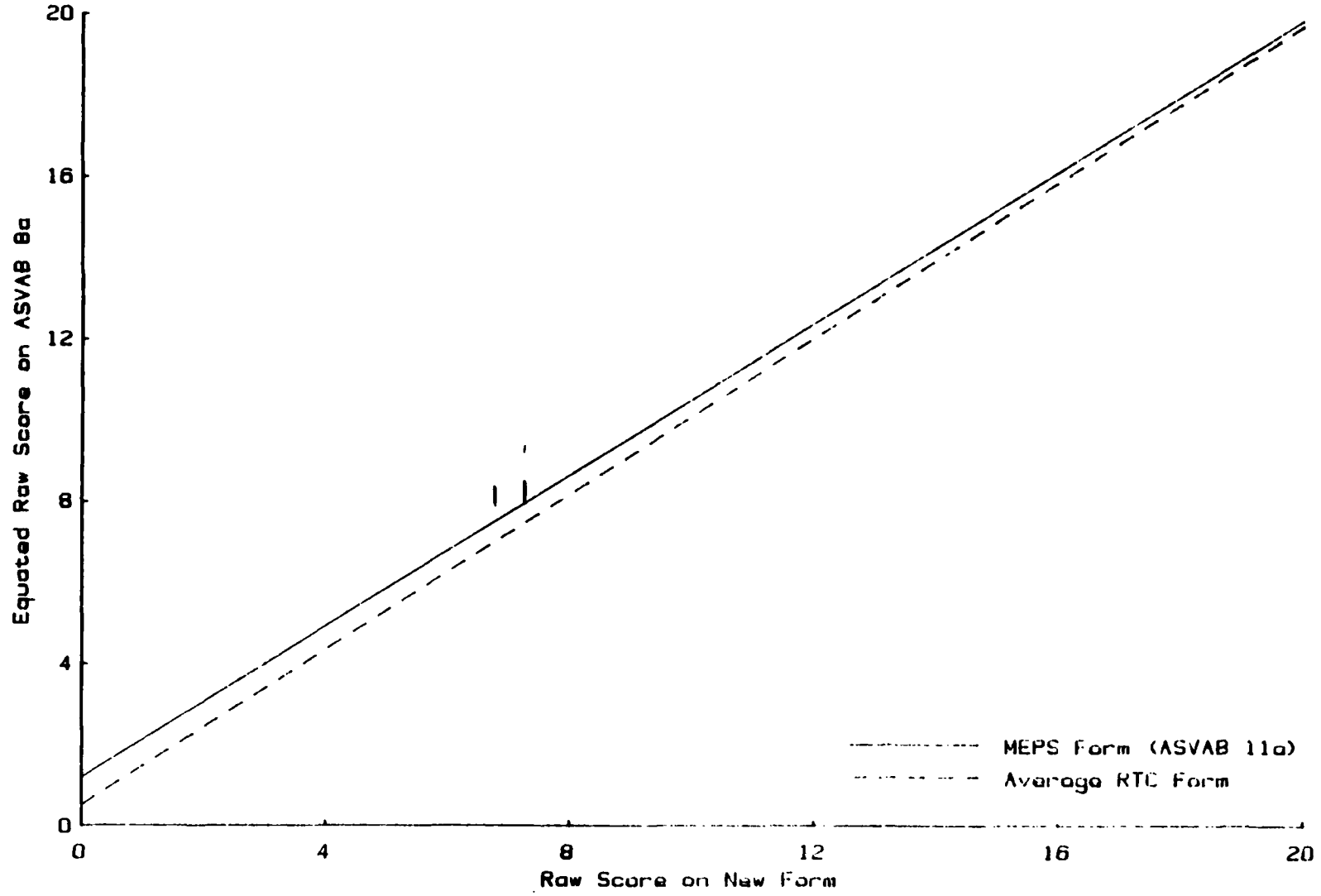

Figure 8-34. Linear Equating Transformations for Raw Electronics Information Scores.

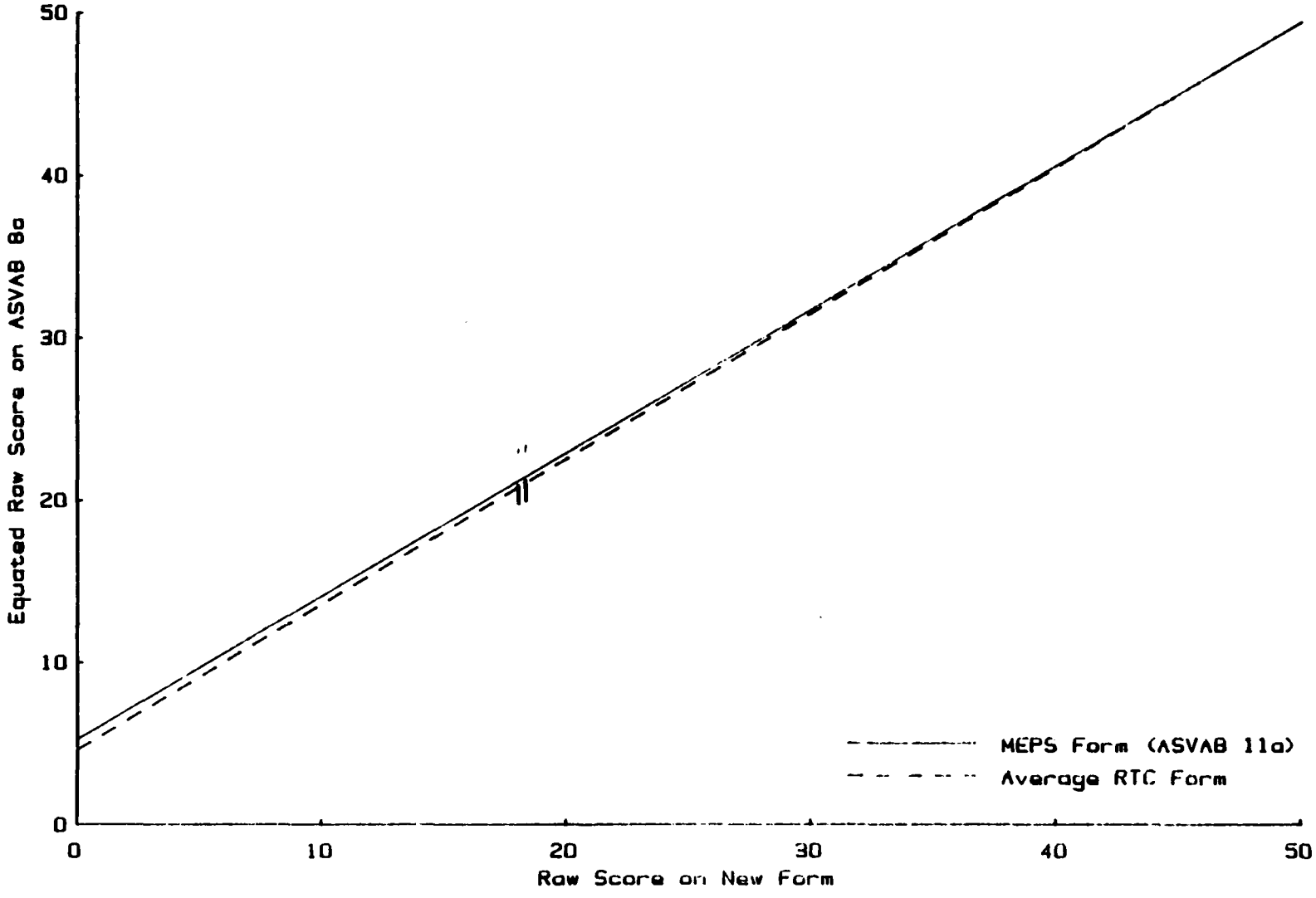

Figure B-35. Linear Equating Transformations for Raw Verbal Composite Scores.

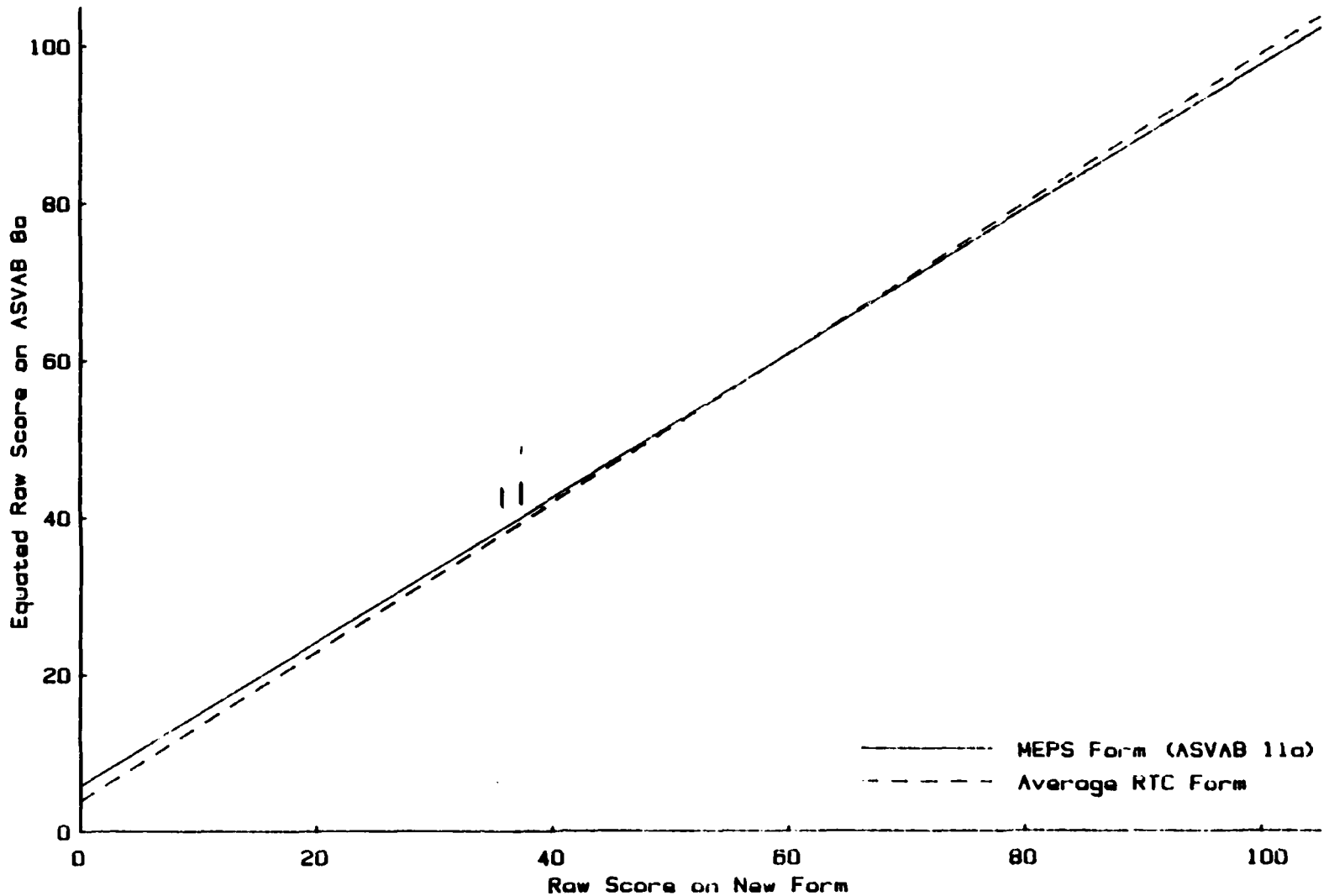

Figure B-36. Linear Equating Transformations for Raw AFQT Composite Scores.

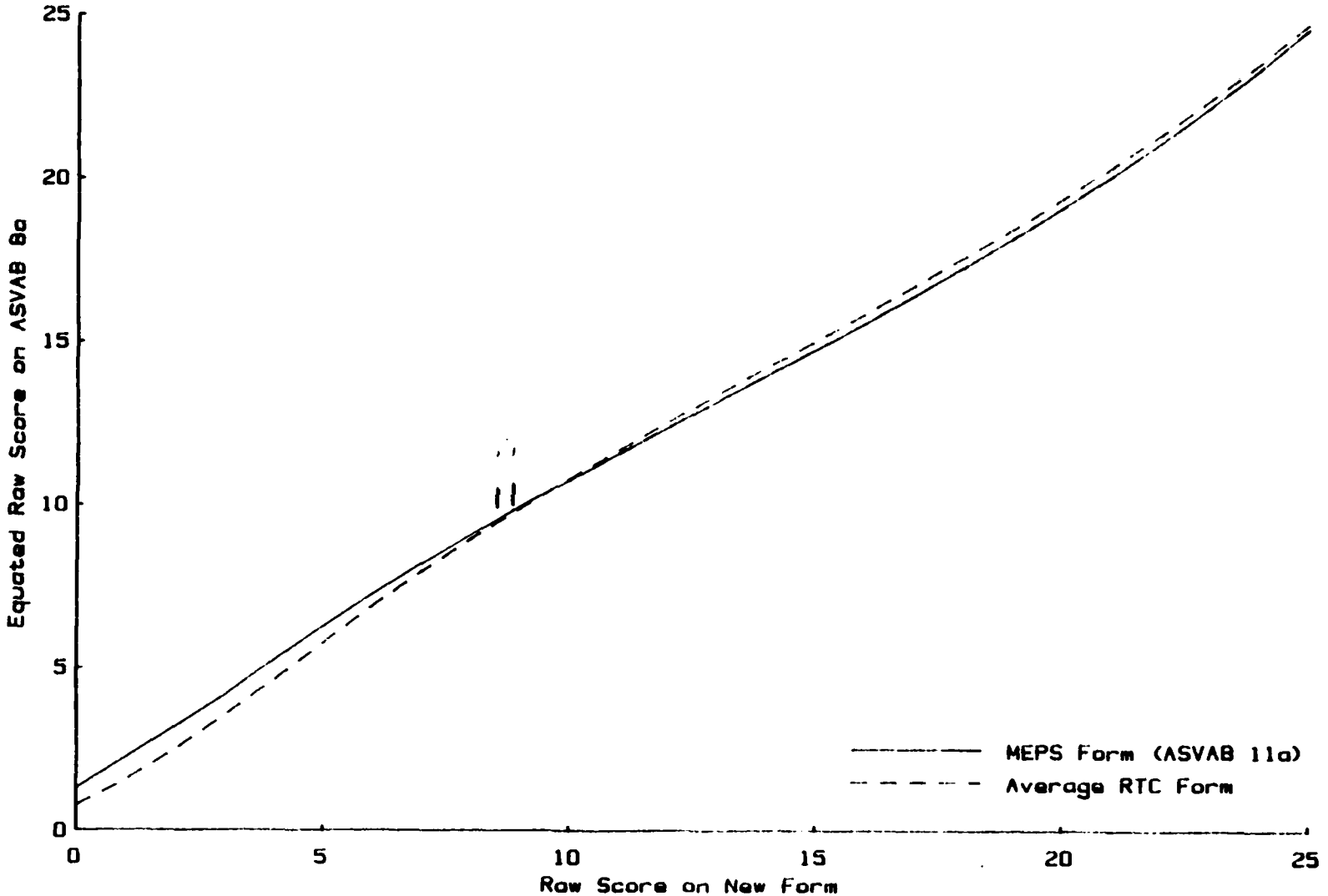

Figure B-37. Smoothed Equipercentile Equating Transformations for Raw General Science Scores.

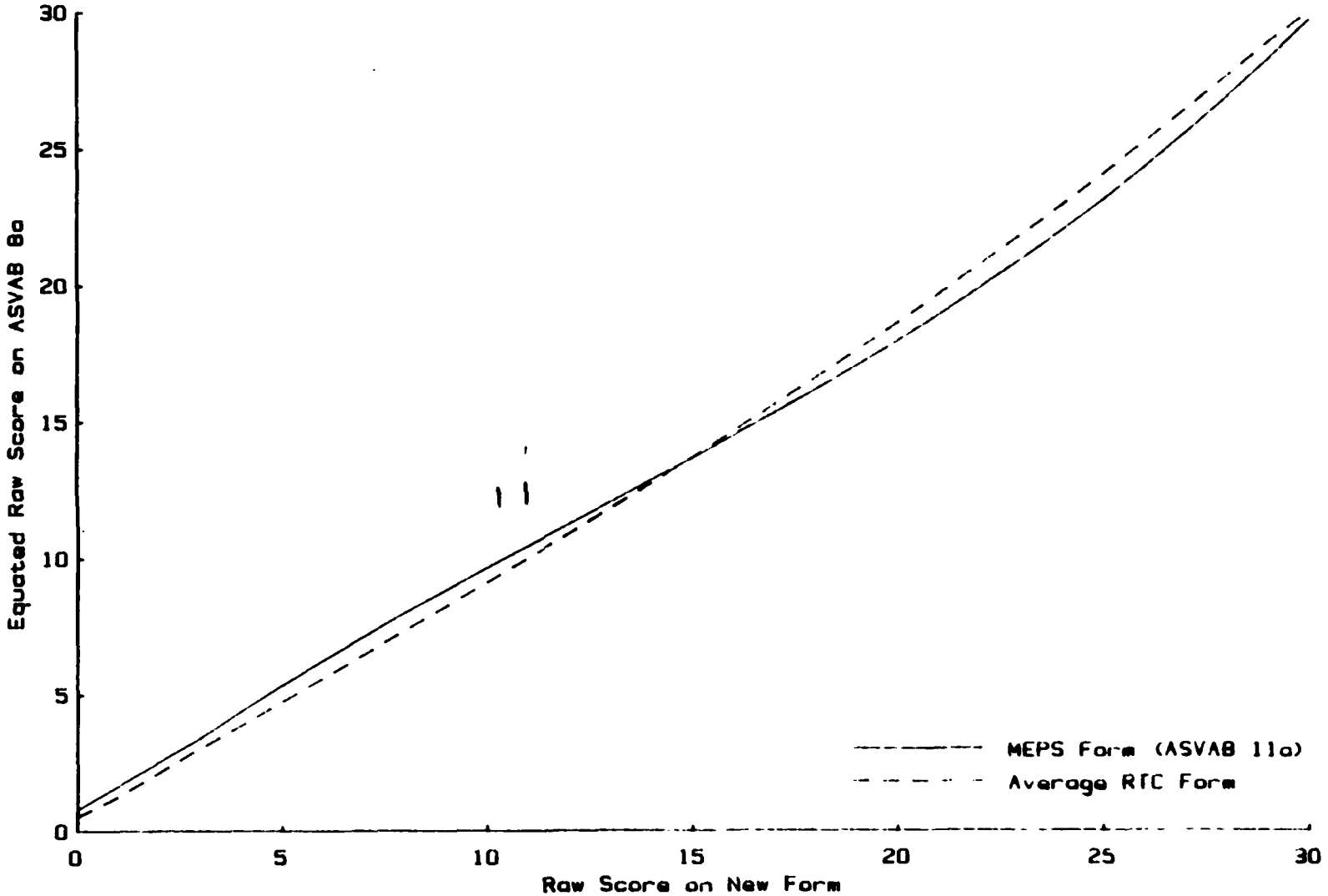

Figure B-38. Smoothed Equipercentile Equating Transformations for Raw Arithmetic Reasoning Scores.

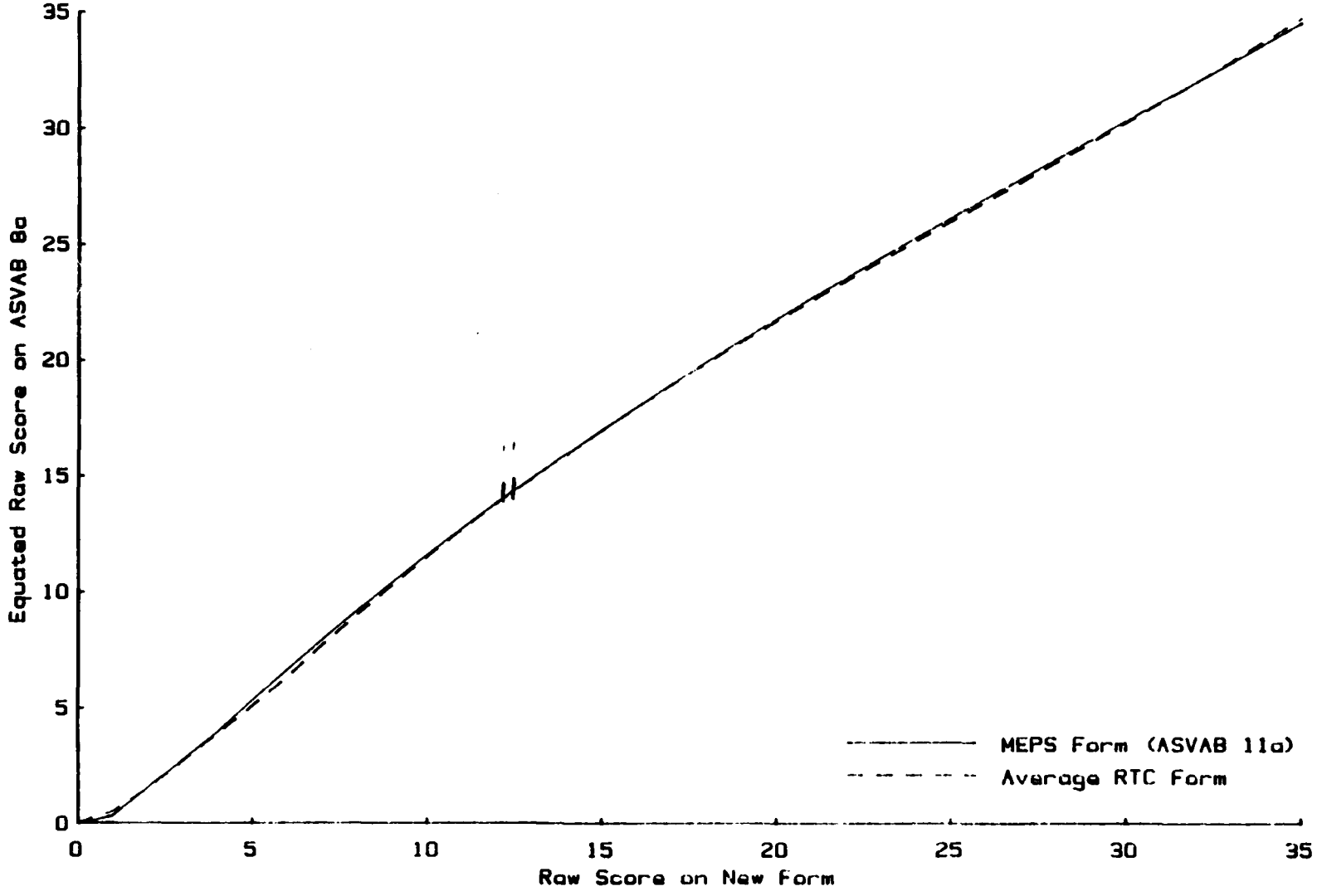

Figure 8-39. Smoothed Equipercentile Equating Transformations for Raw Word Knowledge Scores.

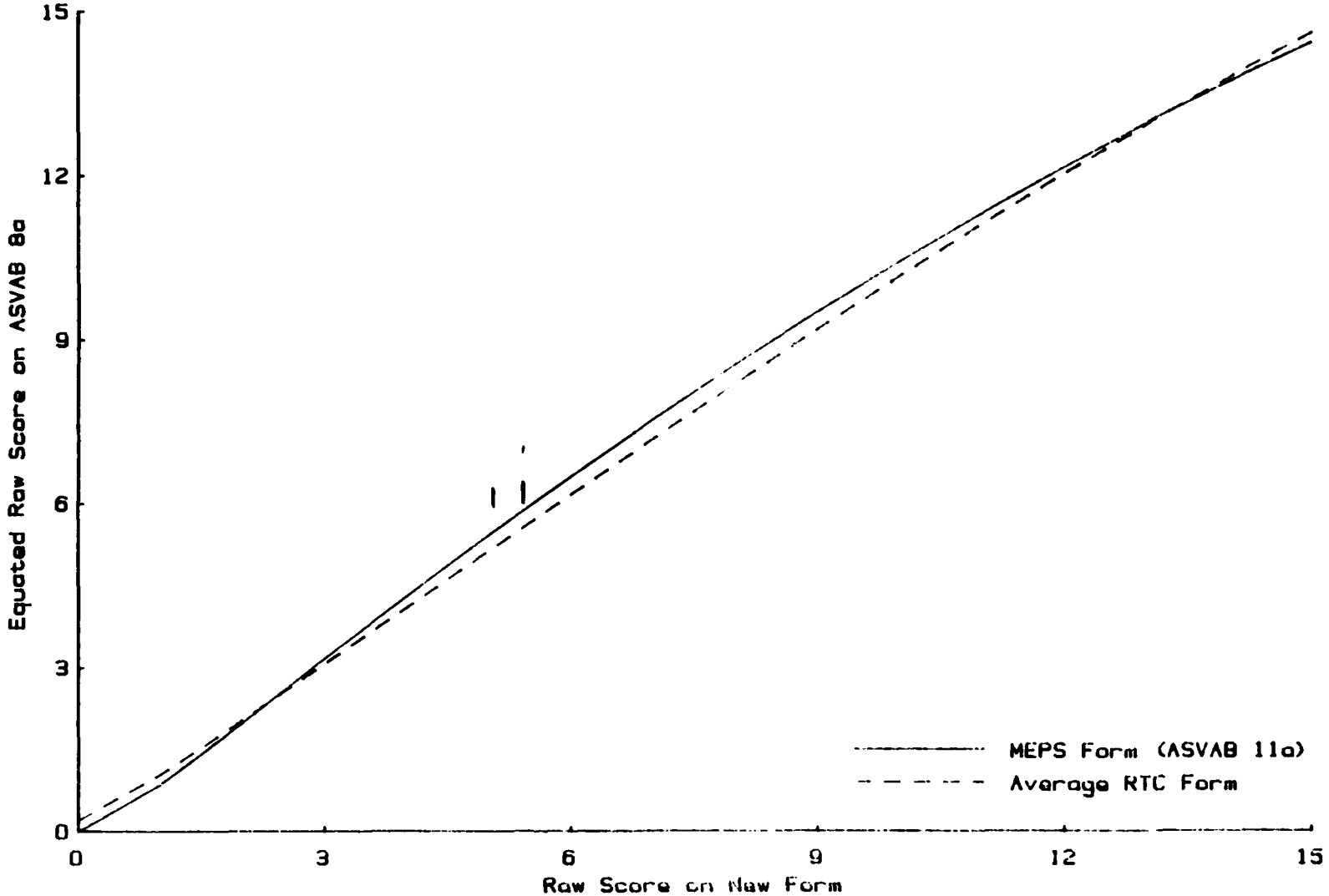

Figure B-40. Smoothed Equipercentile Equating Transformations for Raw Paragraph Comprehension Scores.

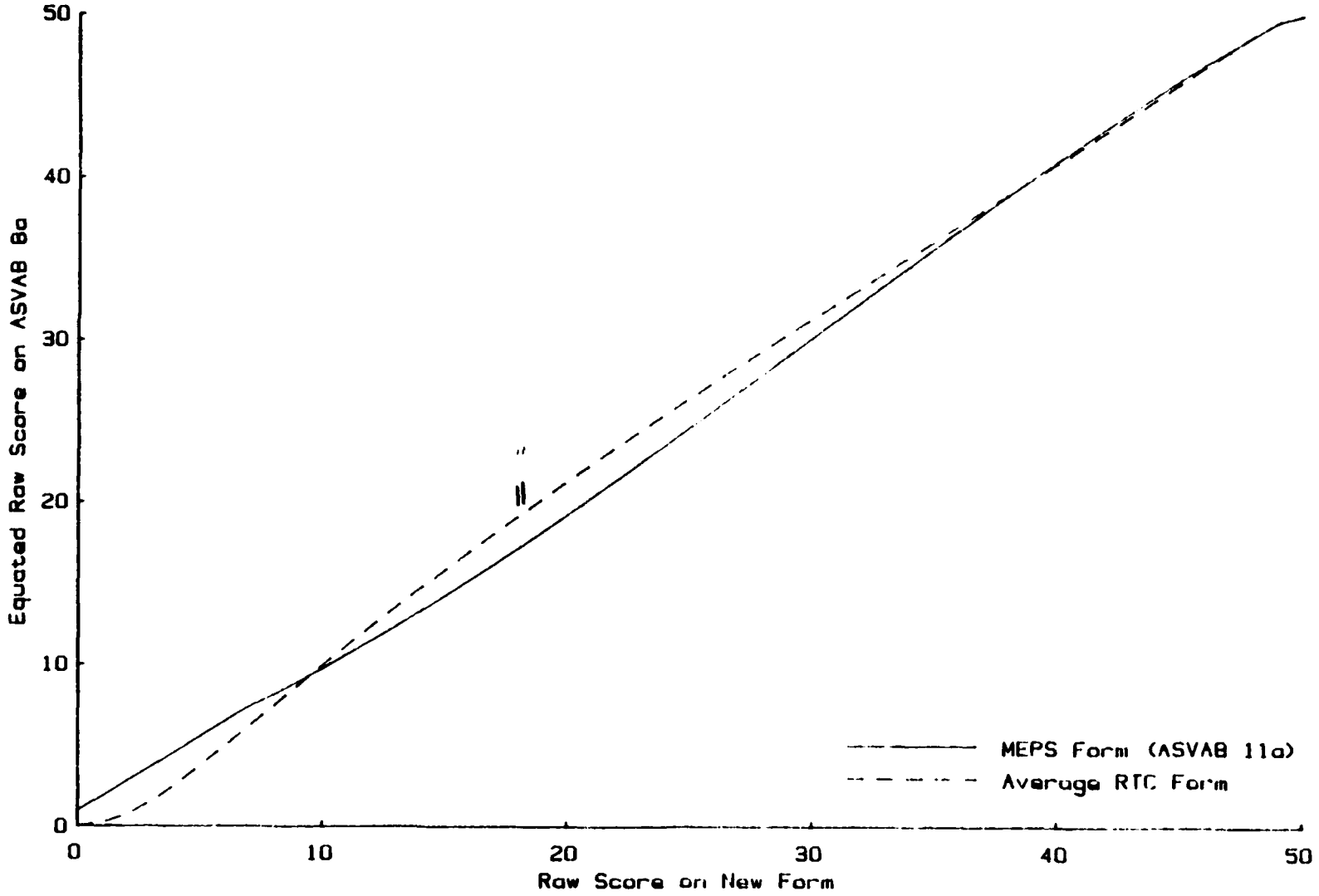

Figure B-41. Smoothed Equipercentile Equating Transformations for Raw Numerical Operations Scores.

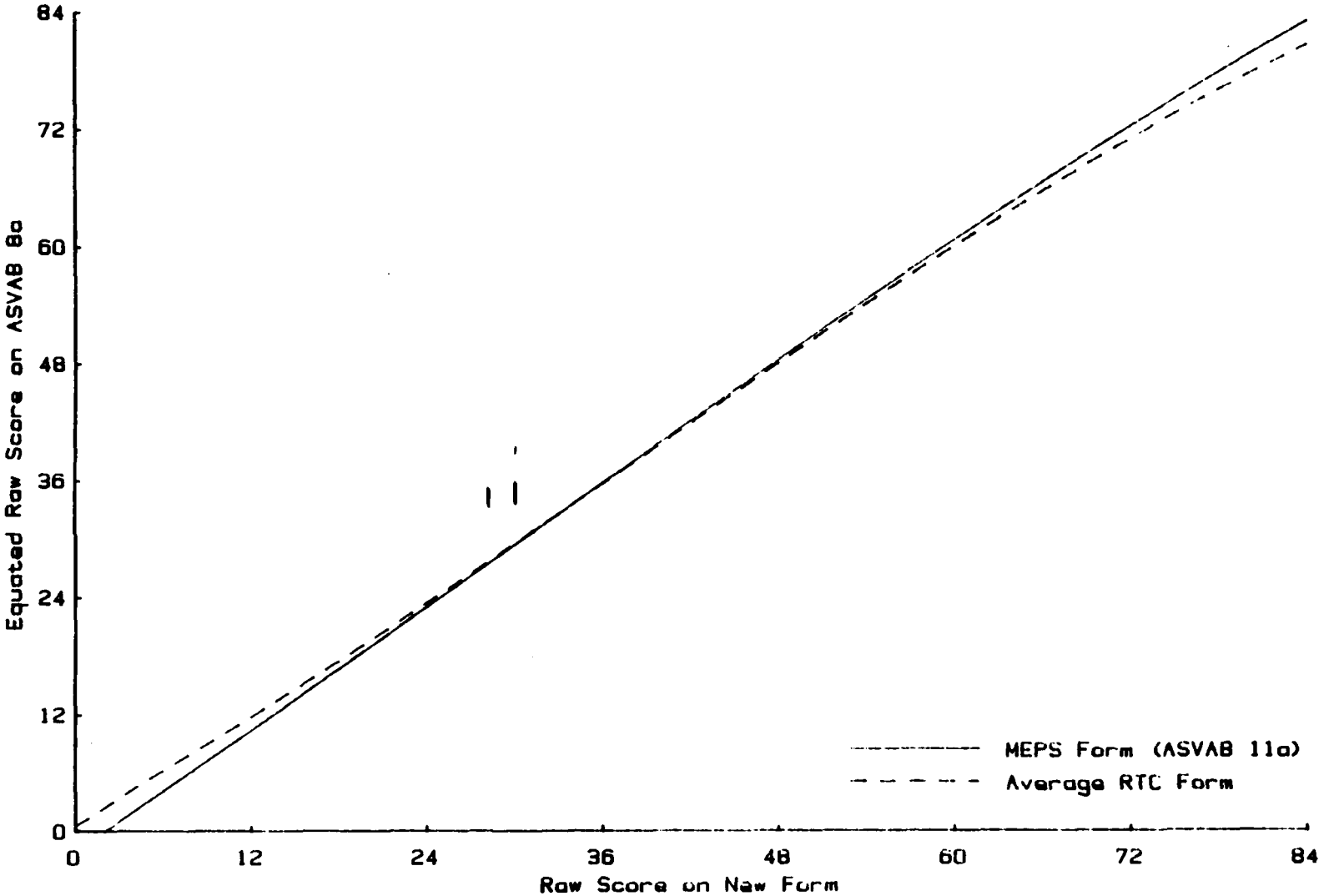

Figure B-42. Smoothed Equipercentile Equating Transformations for Raw Coding Speed Scores.

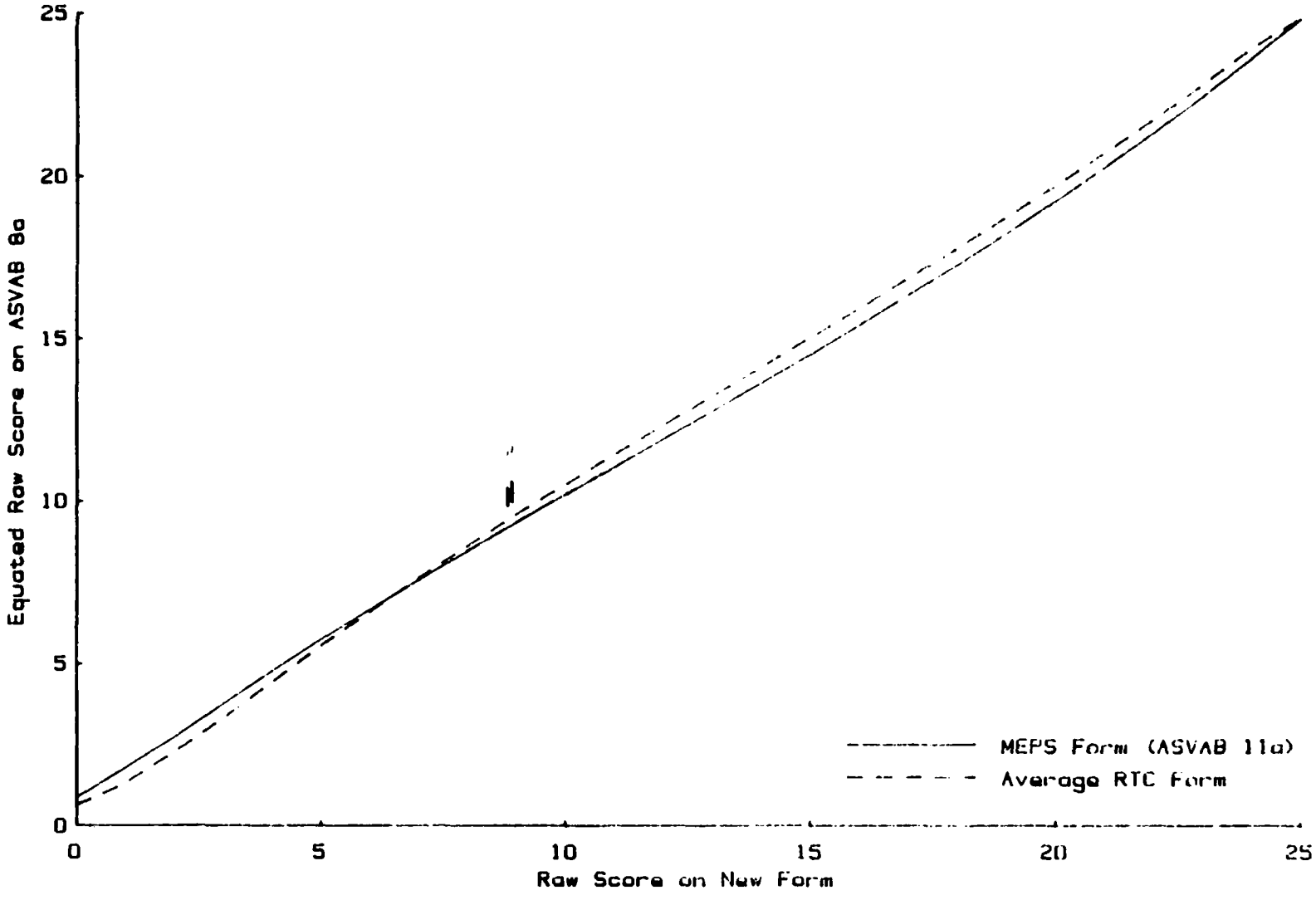

Figure B-43. Smoothed Equipercentile Equating Transformations for Raw Auto & Shop Information Scores.

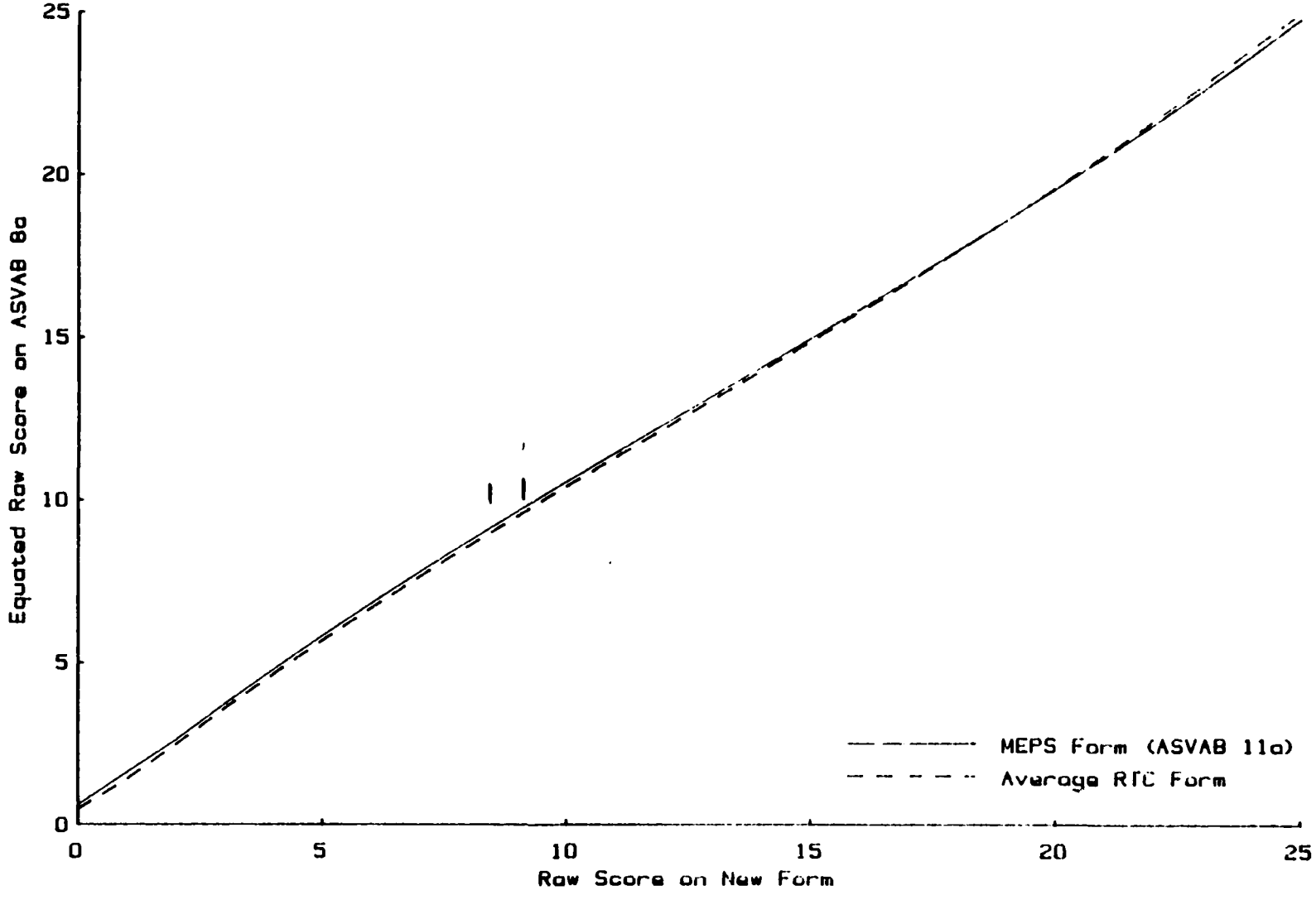

Figure B-44. Smoothed Equipercentile Equating Transformations for Raw Mathematics Knowledge Scores.

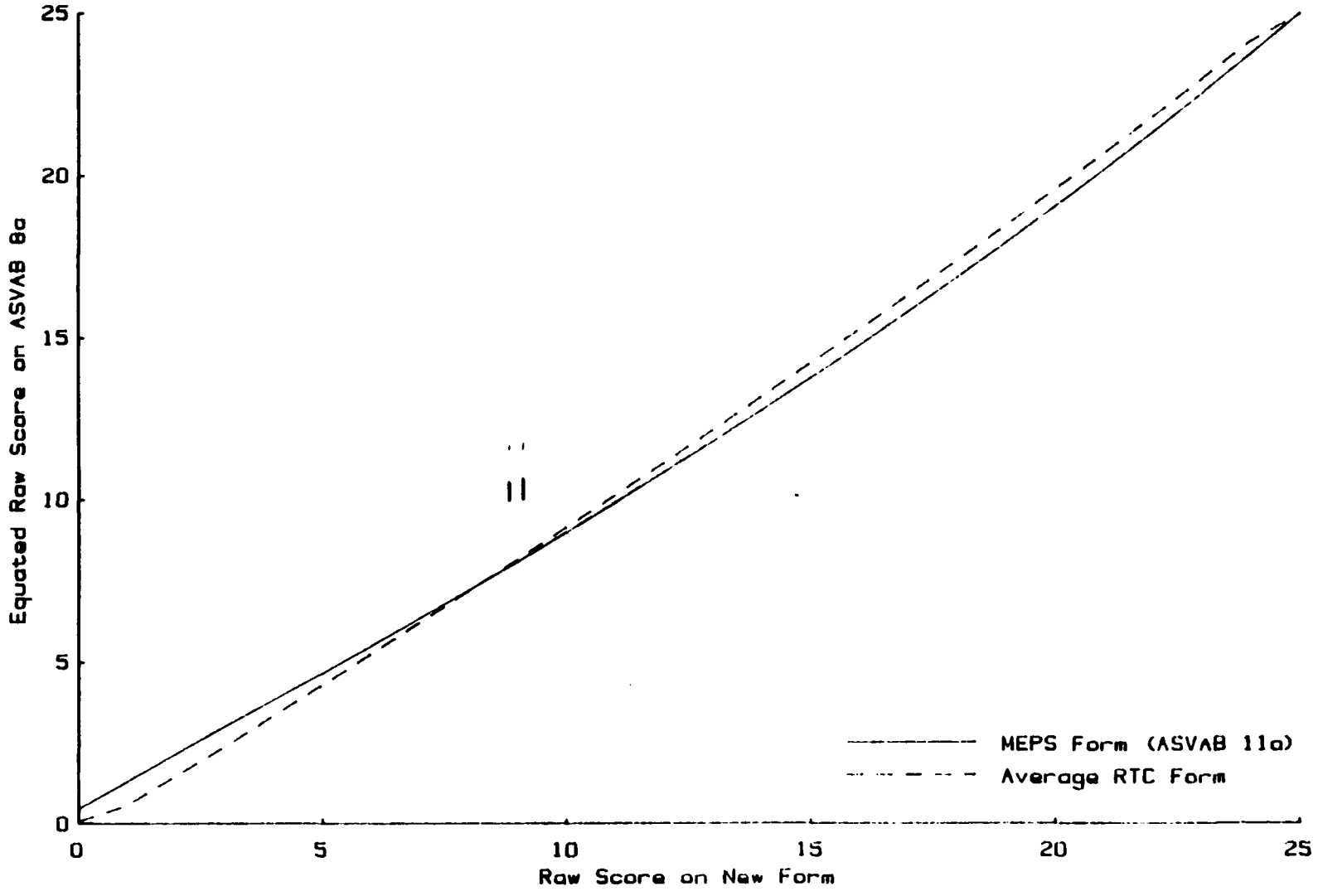

Figure B-45. Smoothed Equipercentile Equating Transformations for Raw Mechanical Comprehension Scores.

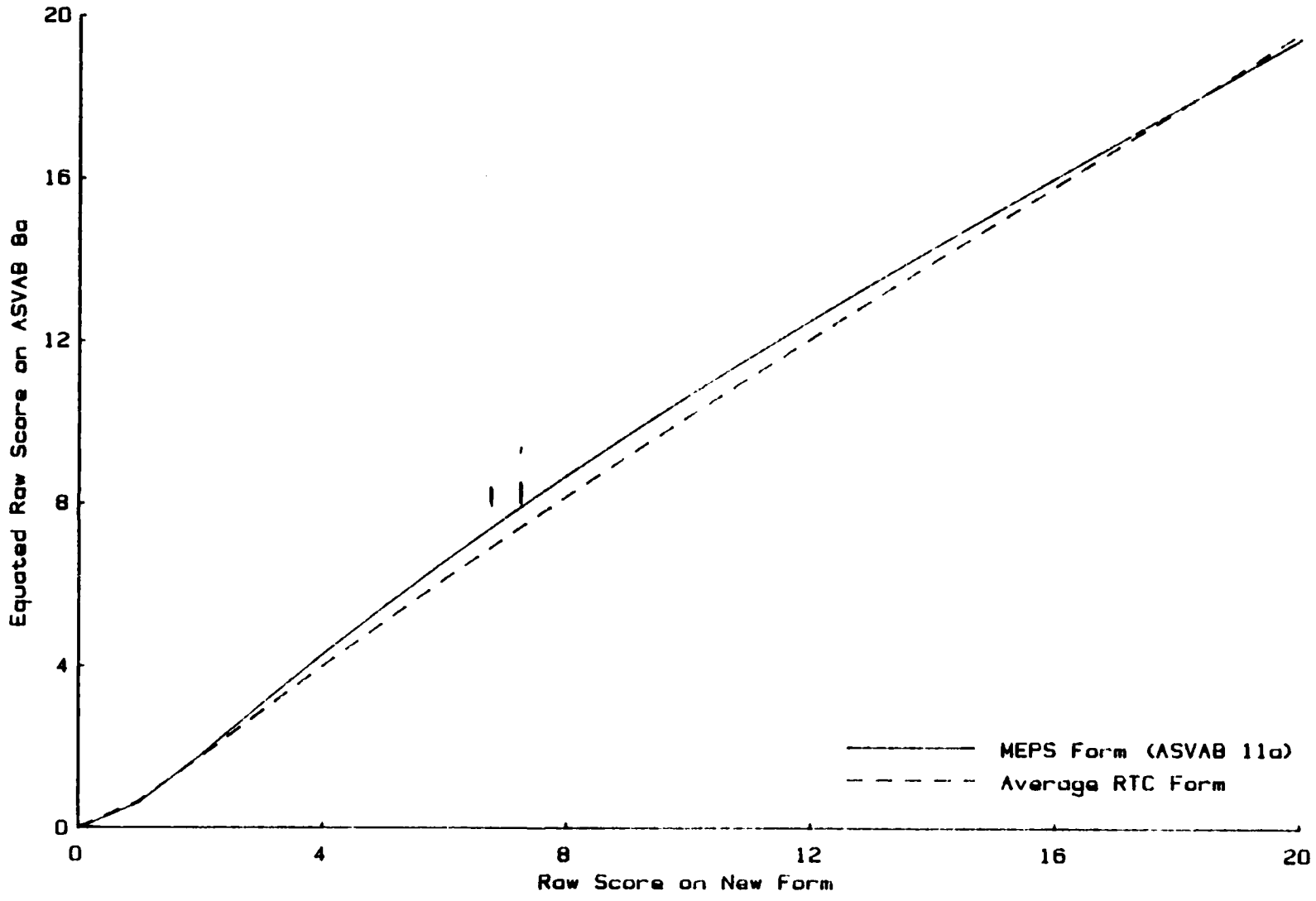

Figure B-46. Smoothed Equipercentile Equating Transformations for Raw Electronics Information Scores.

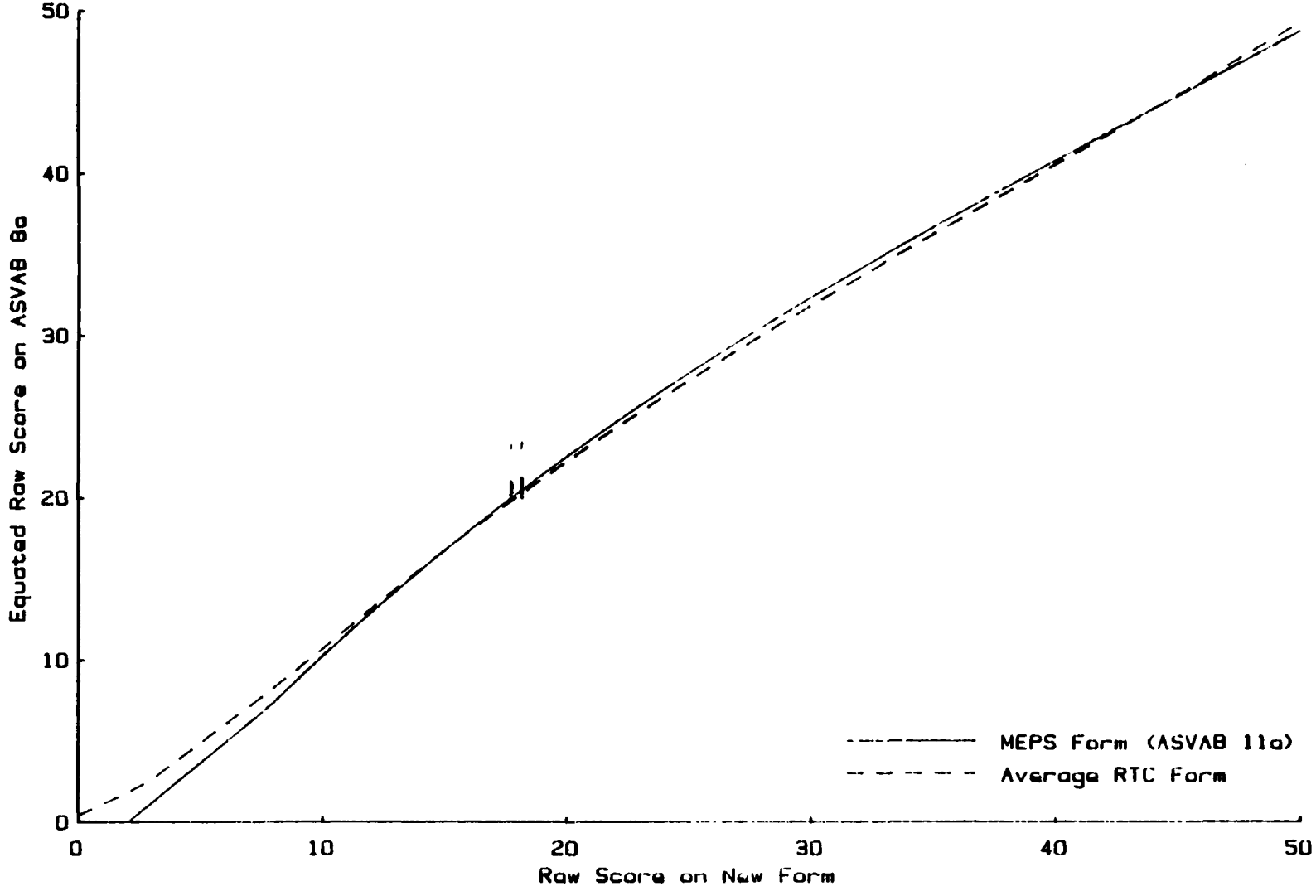

Figure B-47. Smoothed Equipercentile Equating Transformations for Raw Verbal Composite Scores.

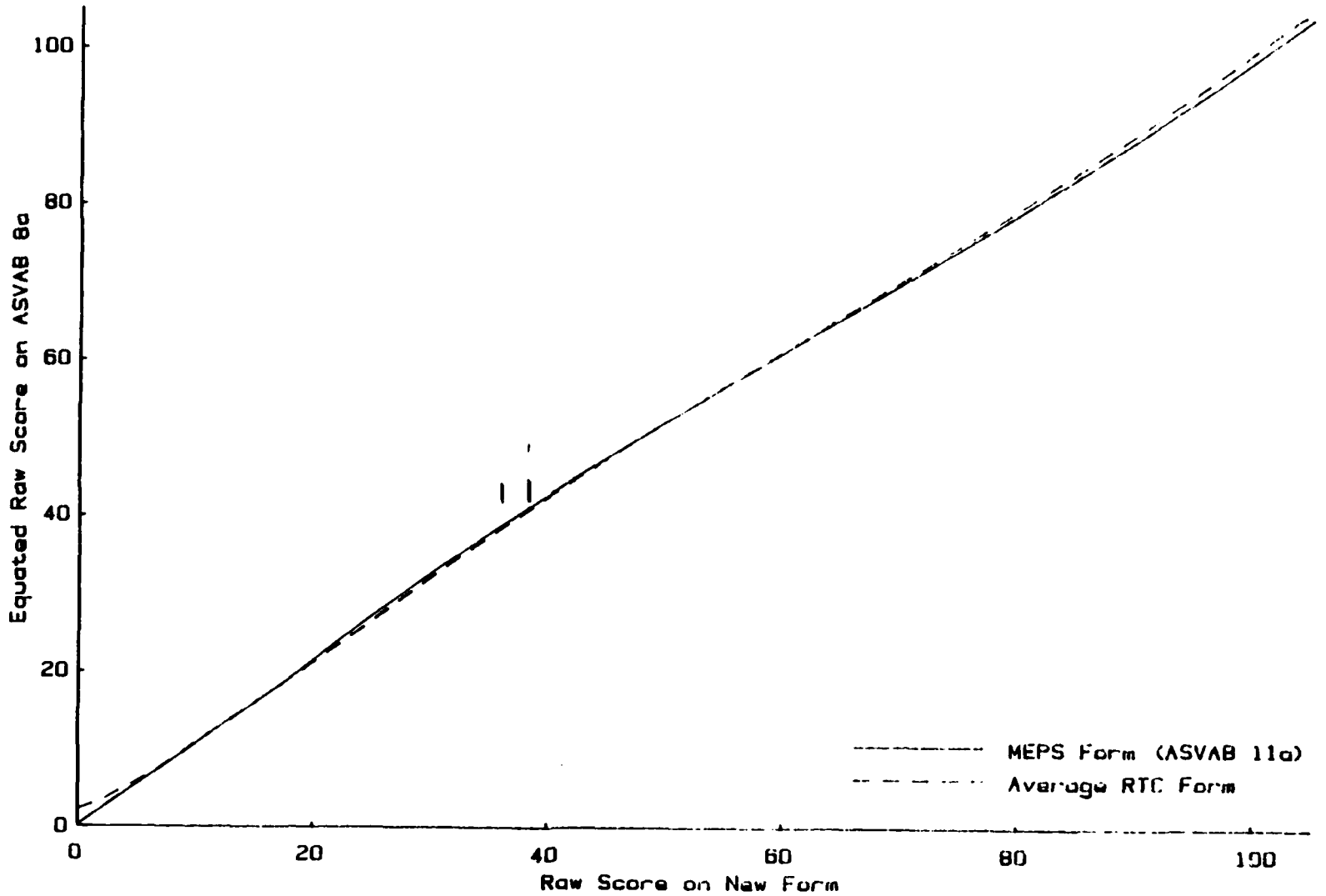

Figure B-48. Smoothed Equipercentile Equating Transformations for Raw AFQT Composite Scores.

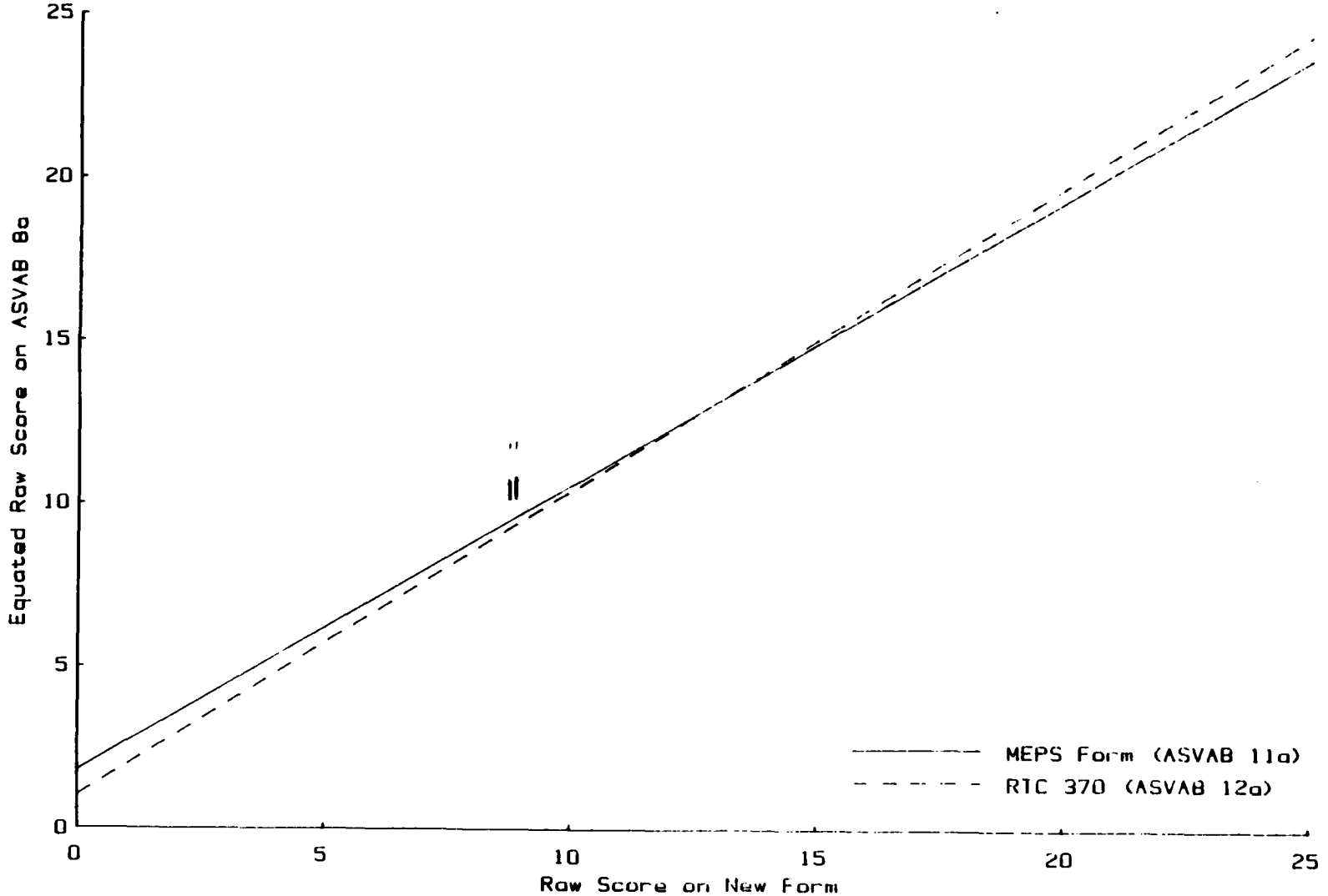

Figure 8-49. Linear Equating Transformations for Raw General Science Scores.

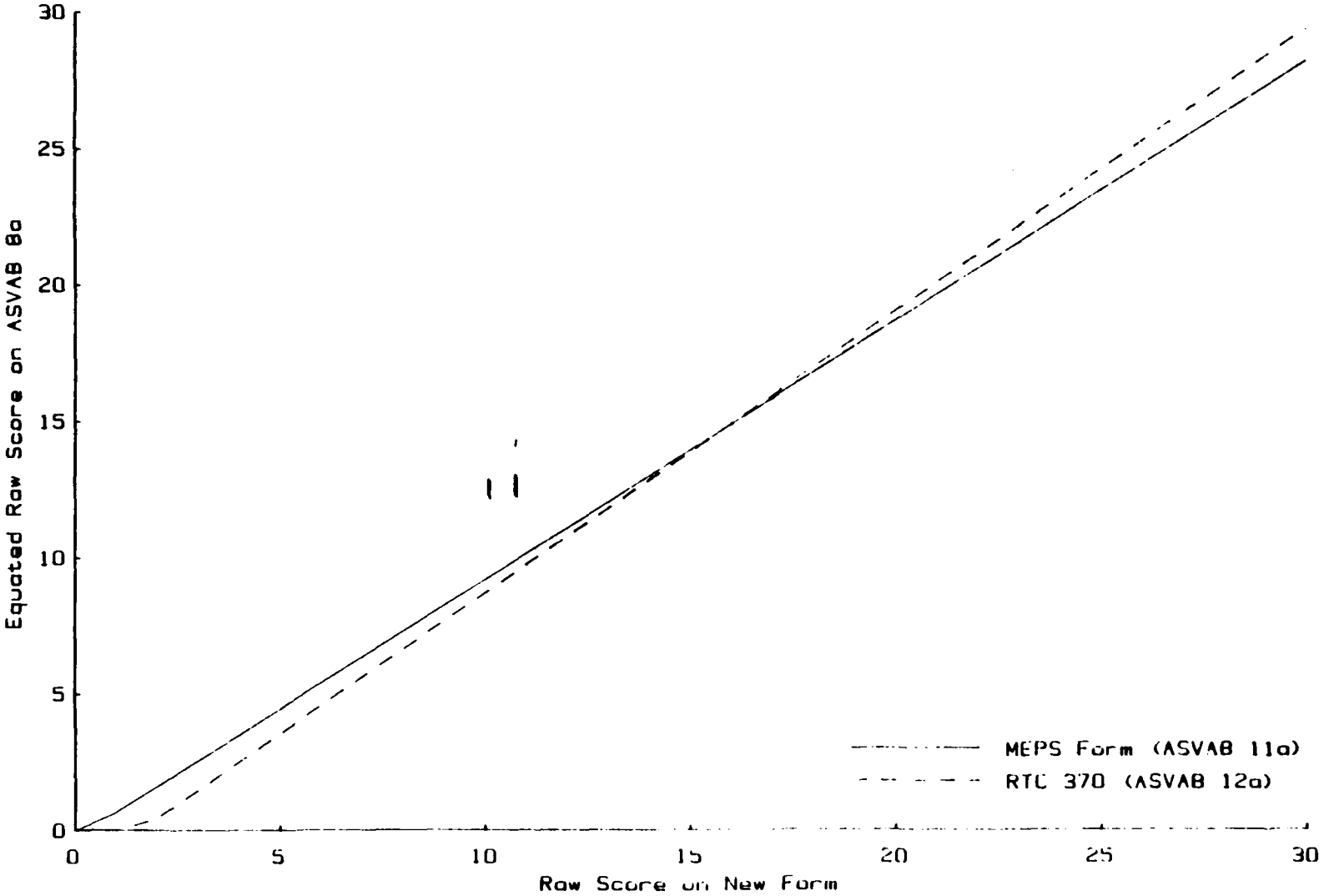

Figure B-50. Linear Equating Transformations for Raw Arithmetic Reasoning Scores.

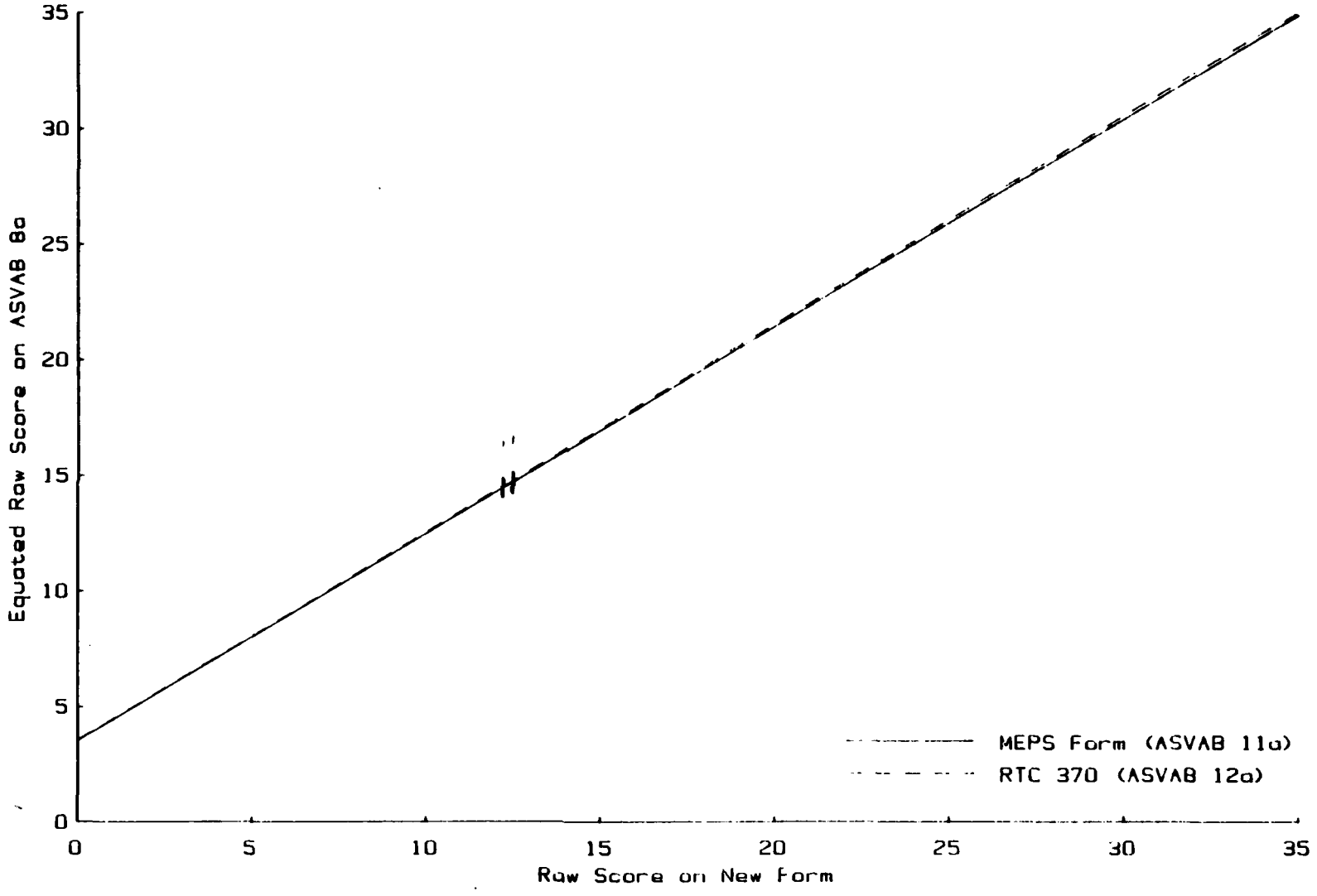

Figure B-51. Linear Equating Transformations for Raw Word Knowledge Scores.

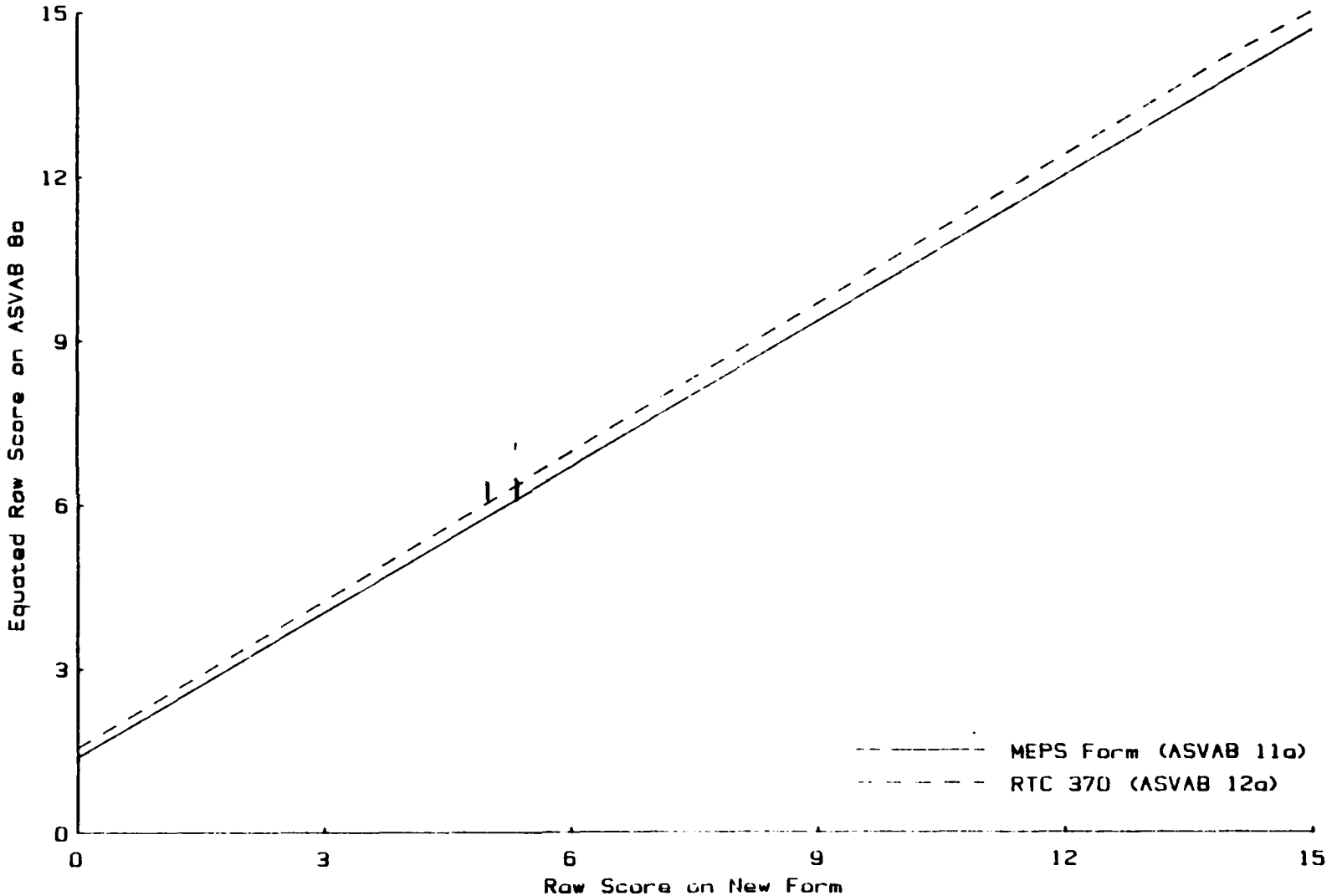

Figure B-52. Linear Equating Transformations for Raw Paragraph Comprehension Scores.

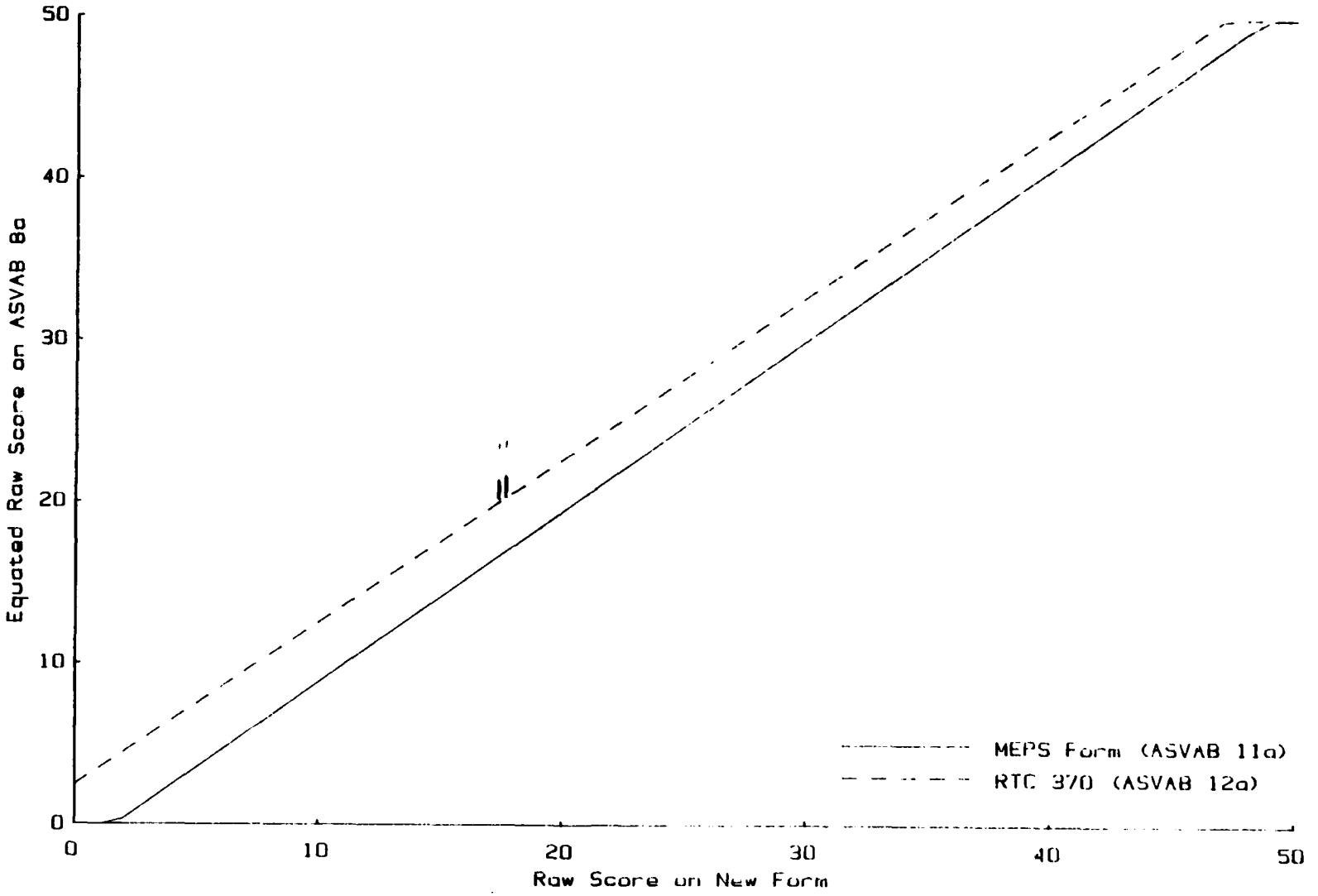

Figure B-53. Linear Equating Transformations for Raw Numerical Operations Scores.

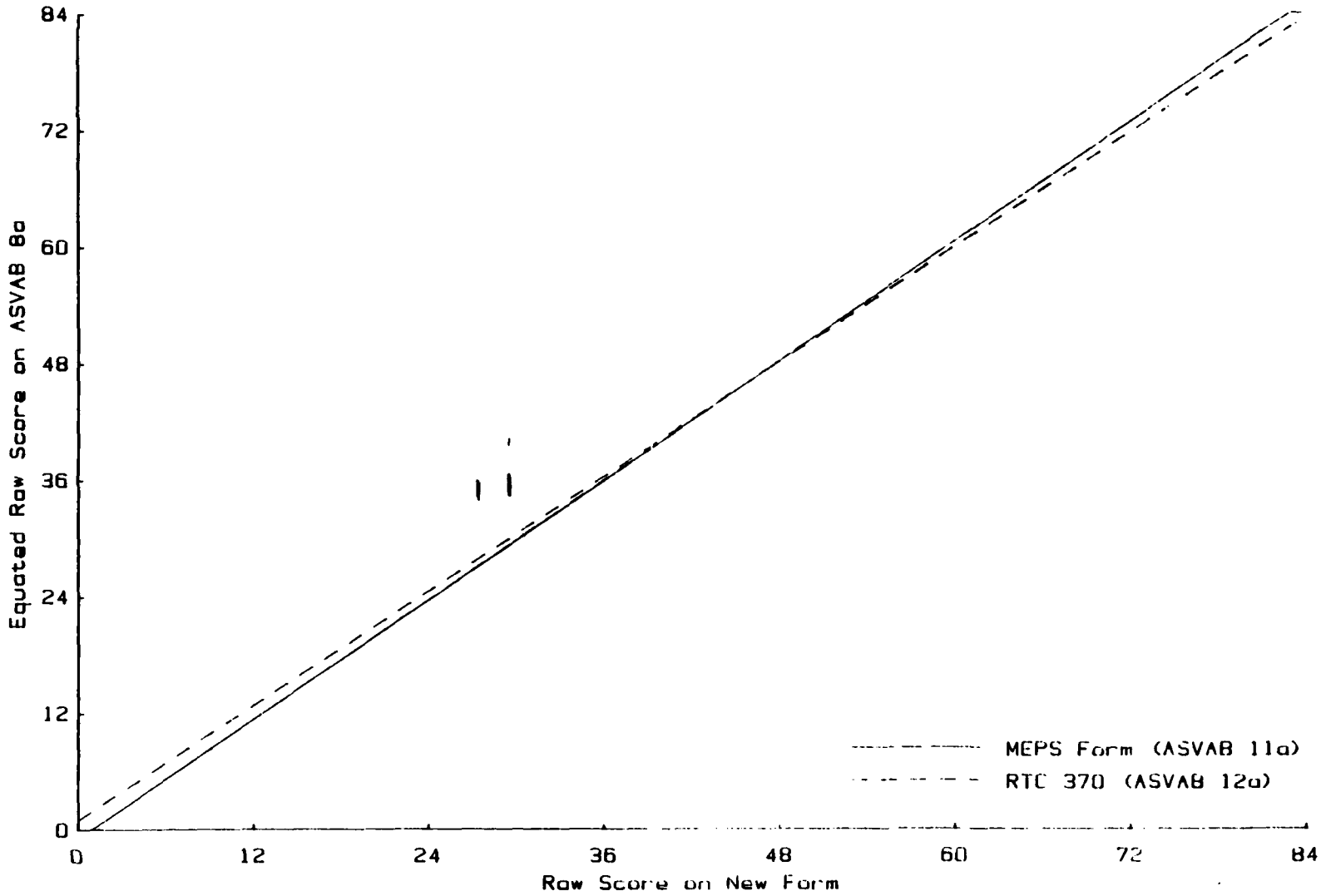

Figure B-54. Linear Equating Transformations for Raw Coding Speed Scores.

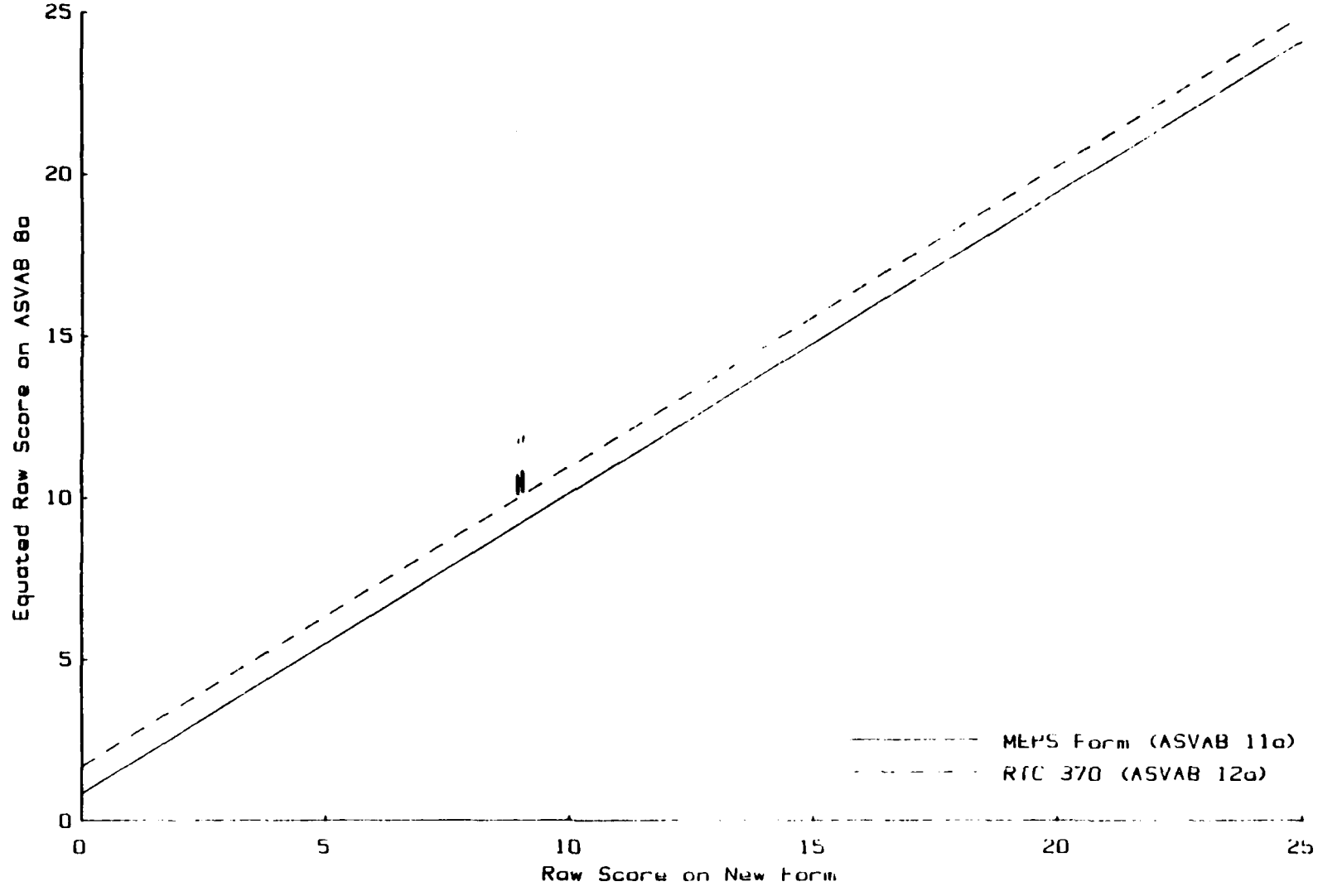

Figure B-55. Linear Equating Transformations for Raw Auto & Shop Information Scores.

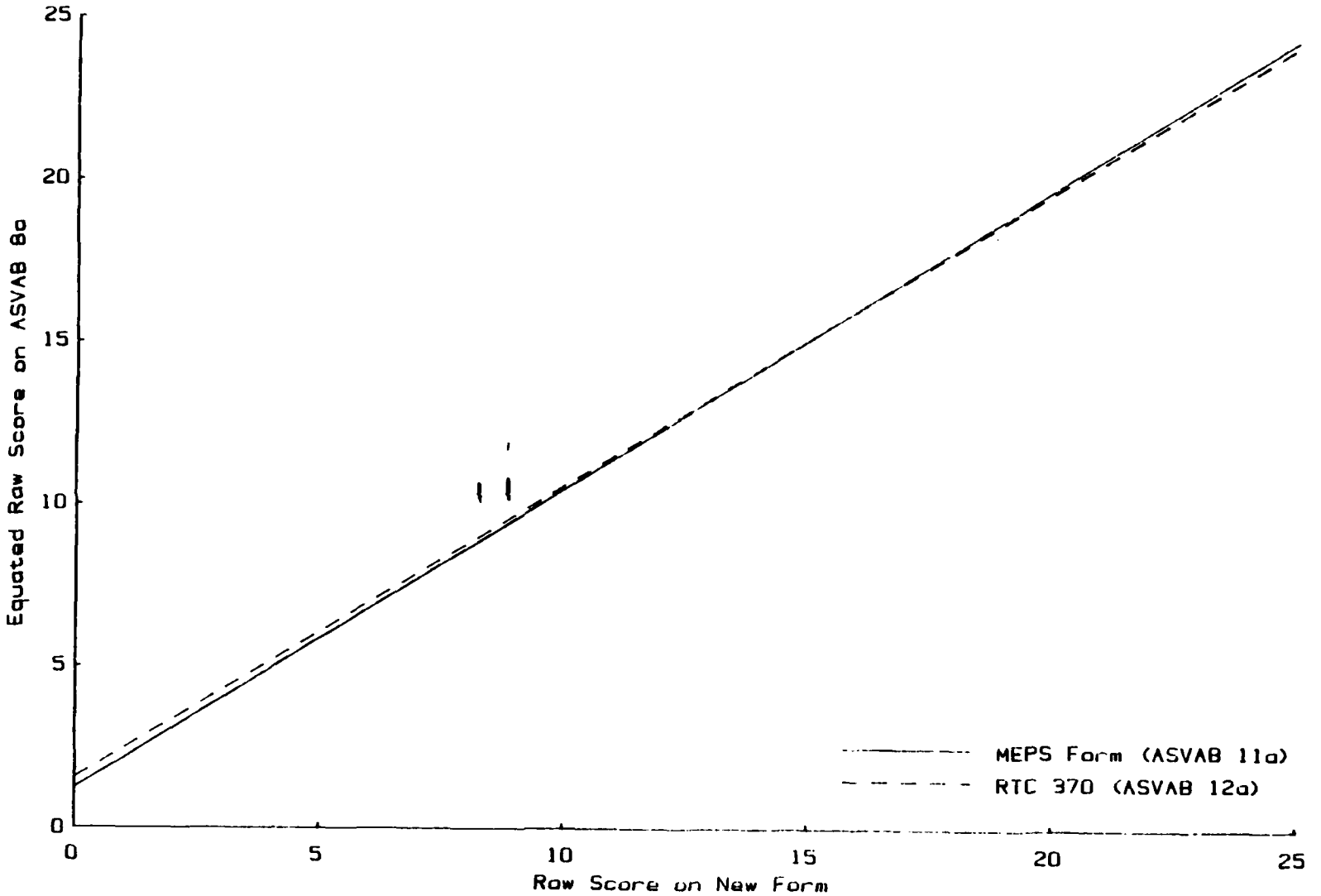

Figure B-56. Linear Equating Transformations for Raw Mathematics Knowledge Scores.

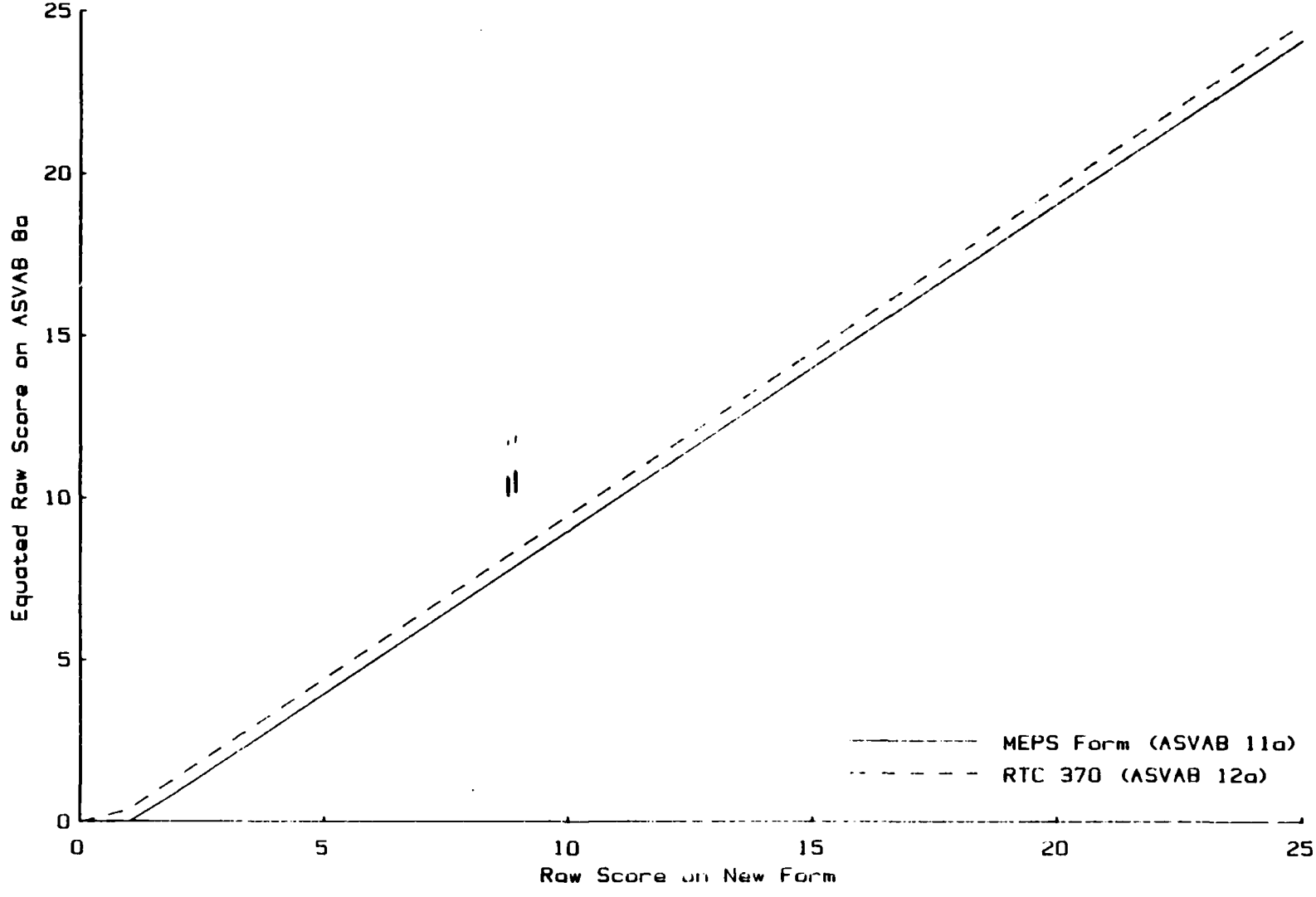

Figure B-57. Linear Equating Transformations for Raw Mechanical Comprehension Scores.

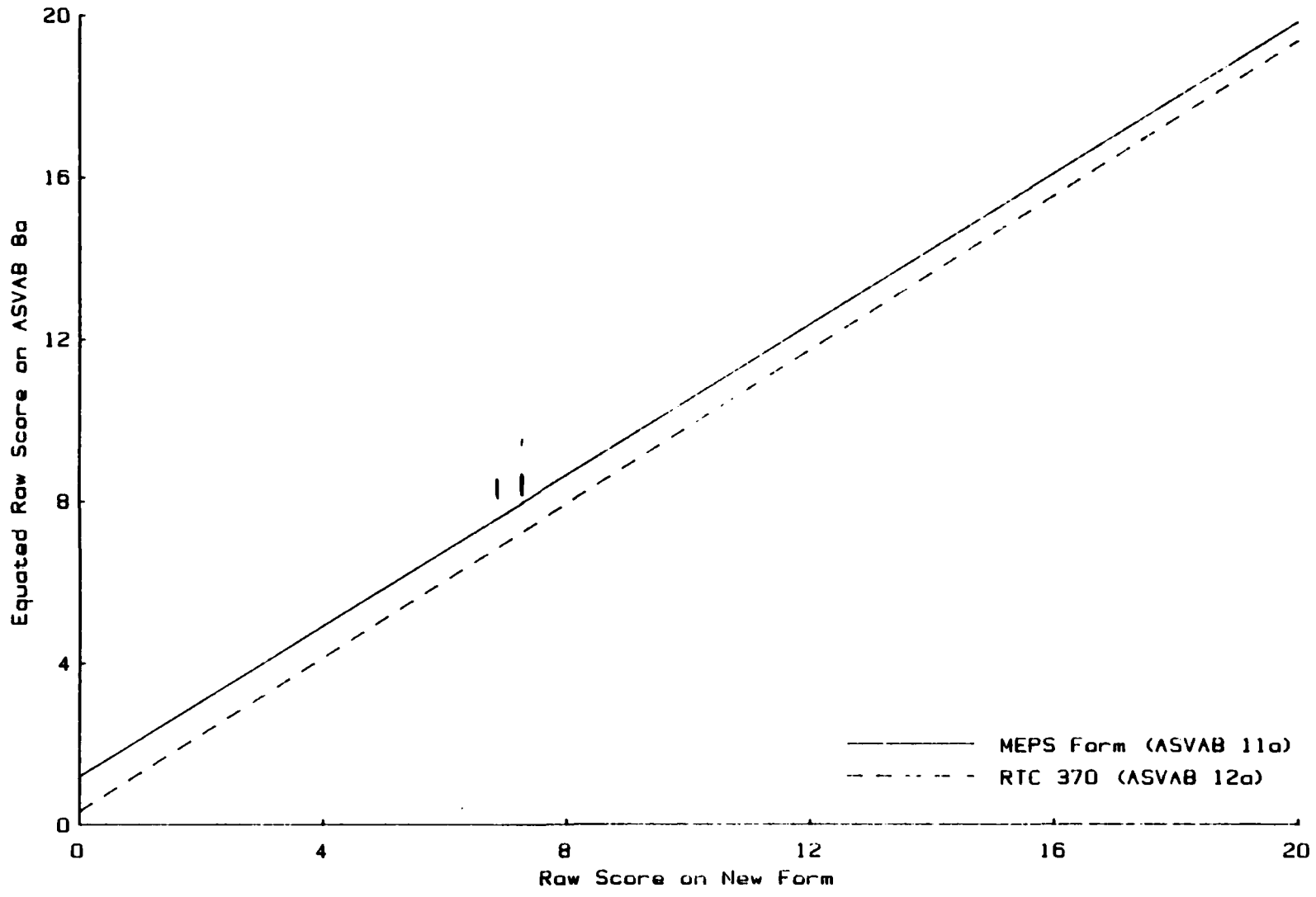

Figure B-58. Linear Equating Transformations for Raw Electronics Information Scores.

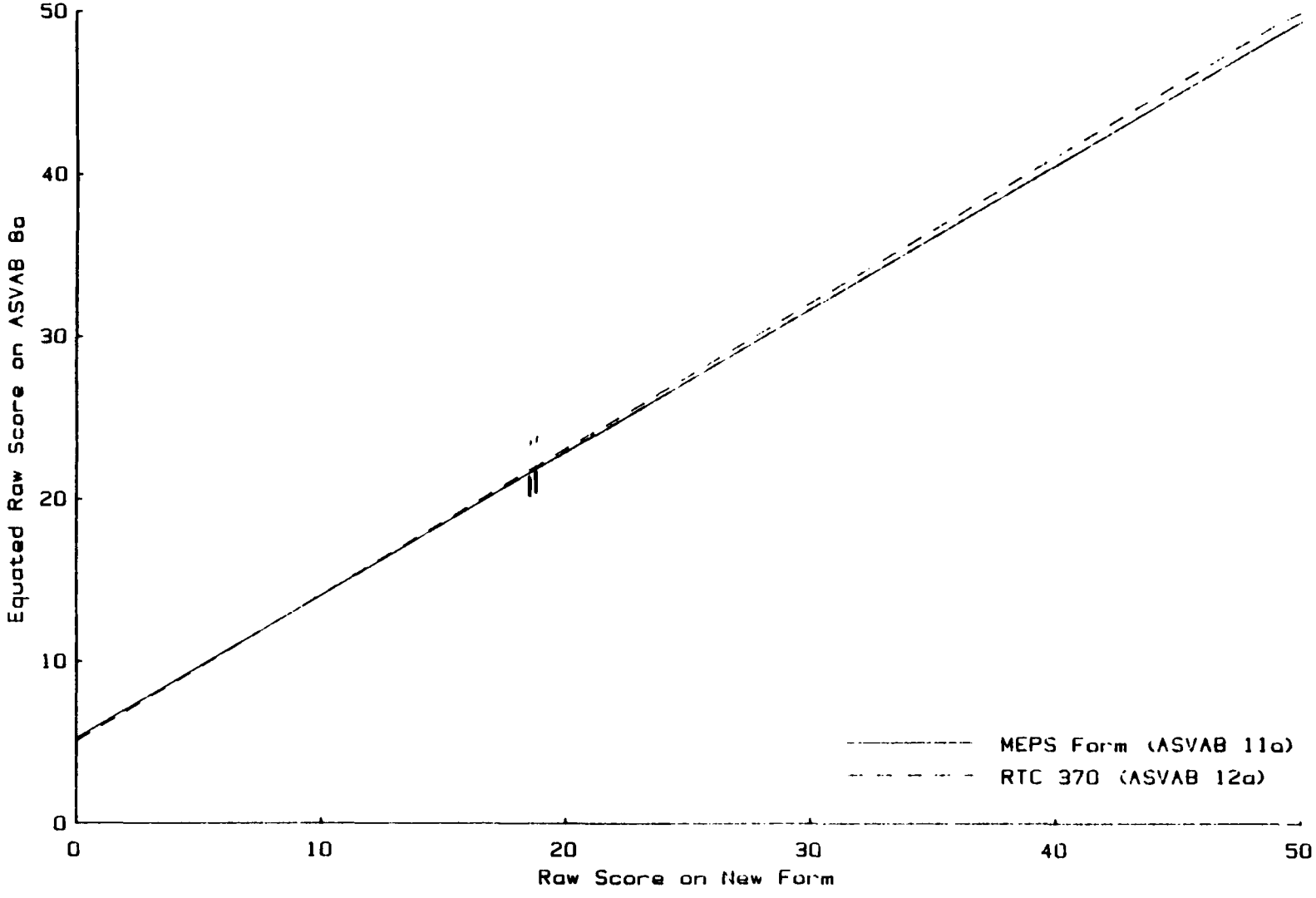

Figure B-59. Linear Equating Transformations for Raw Verbal Composite Scores.

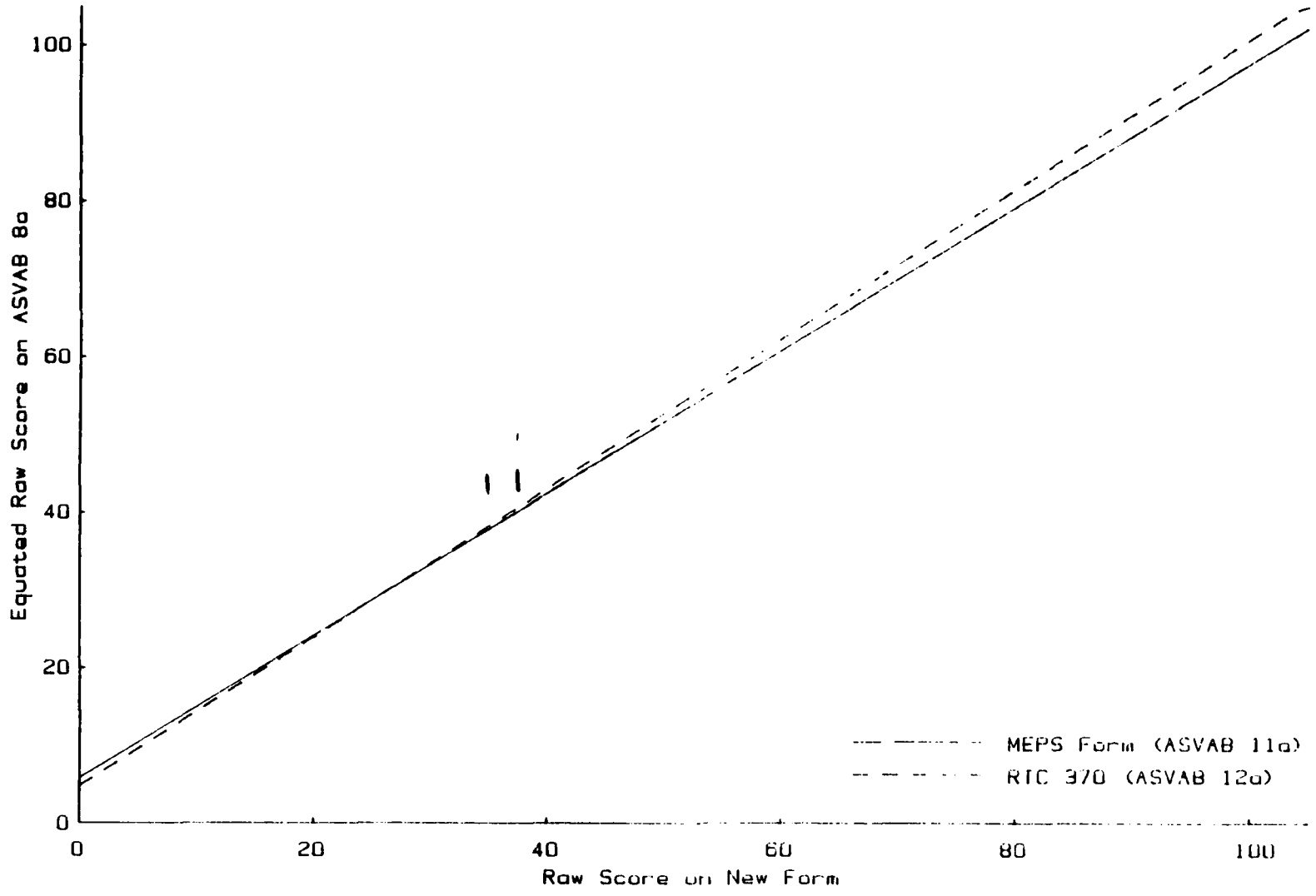

Figure B-60. Linear Equating Transformations for Raw AFQT Composite Scores.

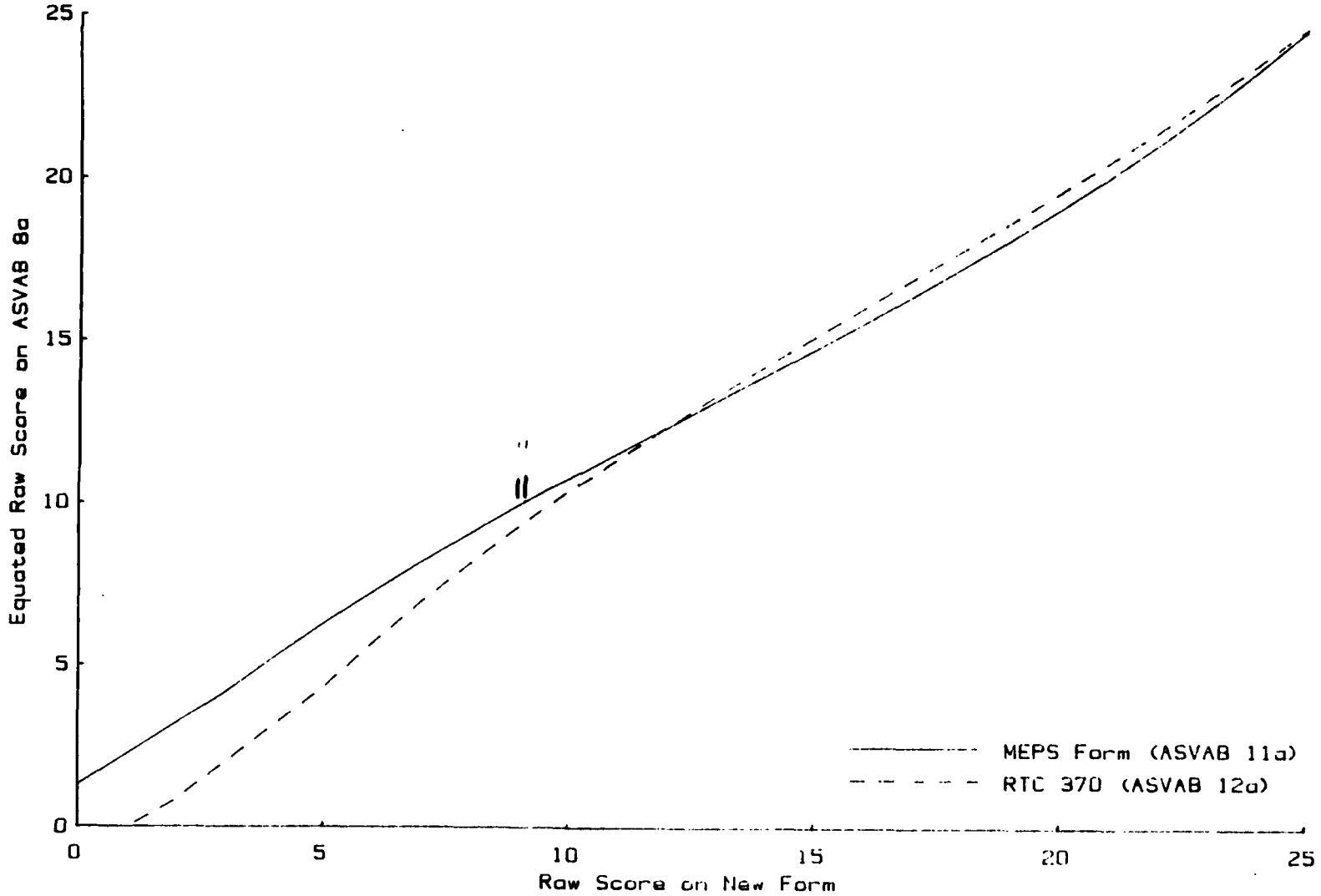

Figure 8-61. Smoothed Equipercentile Equating Transformations for Raw General Science Scores.

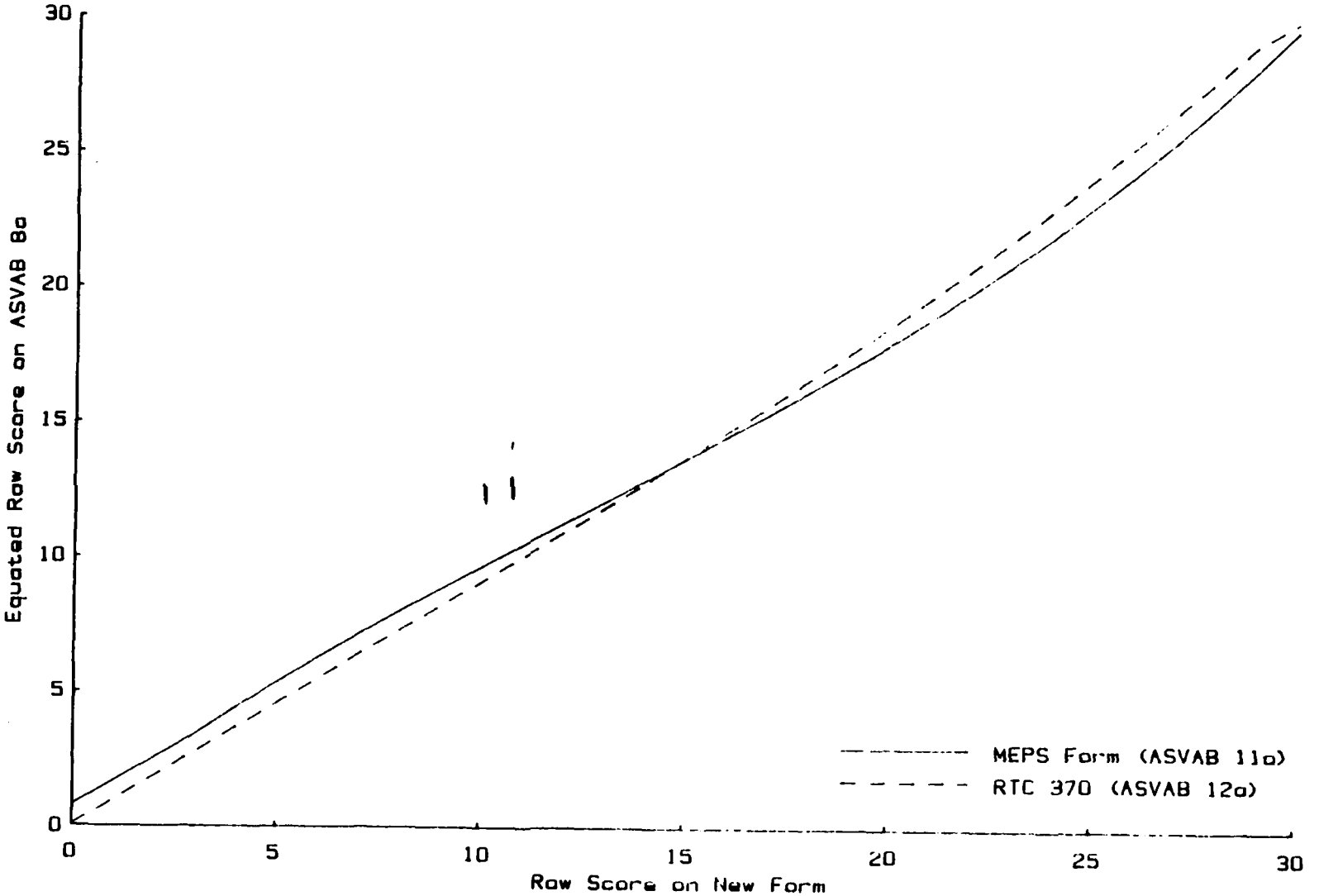

Figure B-62. Smoothed Equipercentile Equating Transformations for Raw Arithmetic Reasoning Scores.

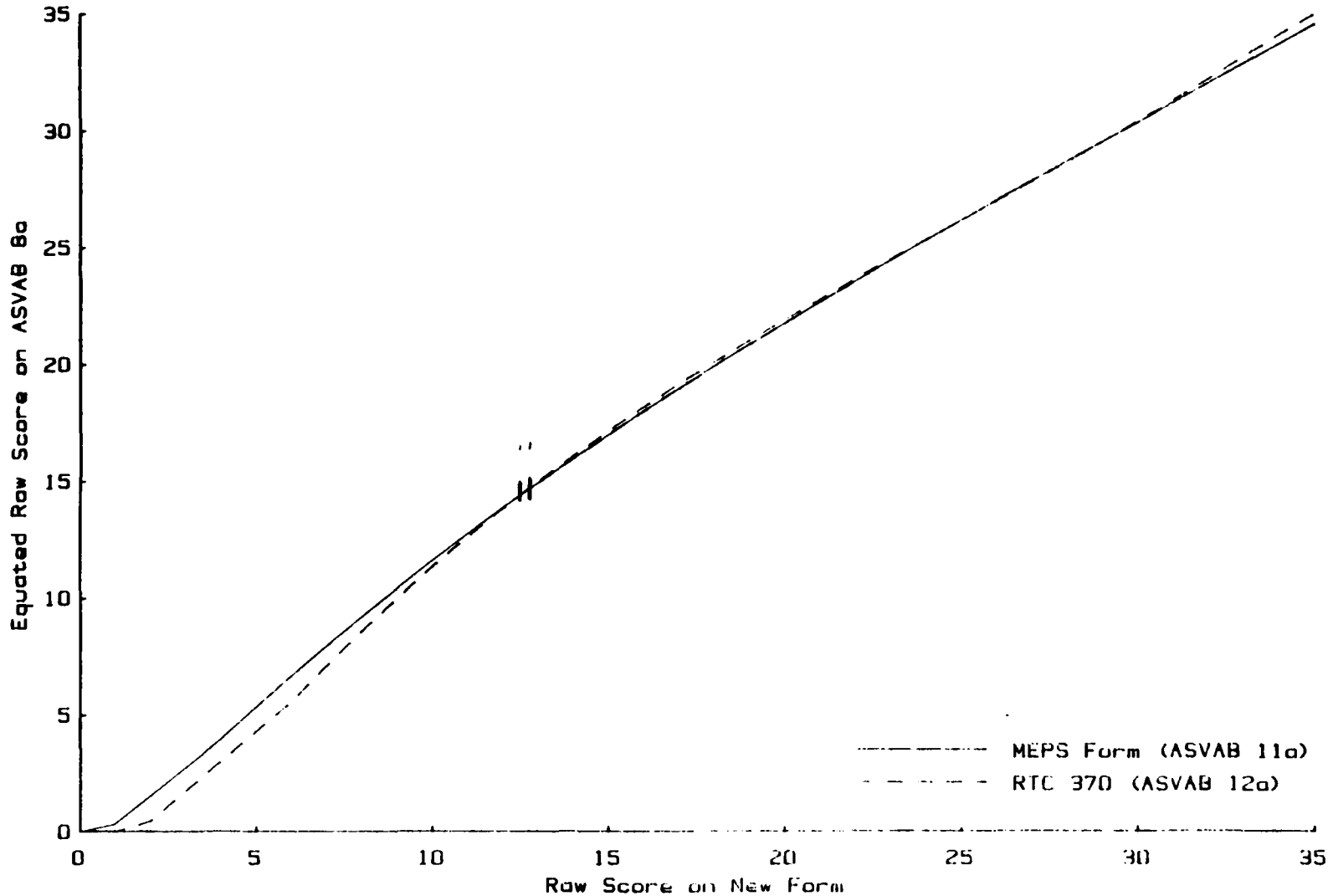

Figure B-63. Smoothed Equipercentile Equating Transformations for Raw Word Knowledge Scores.

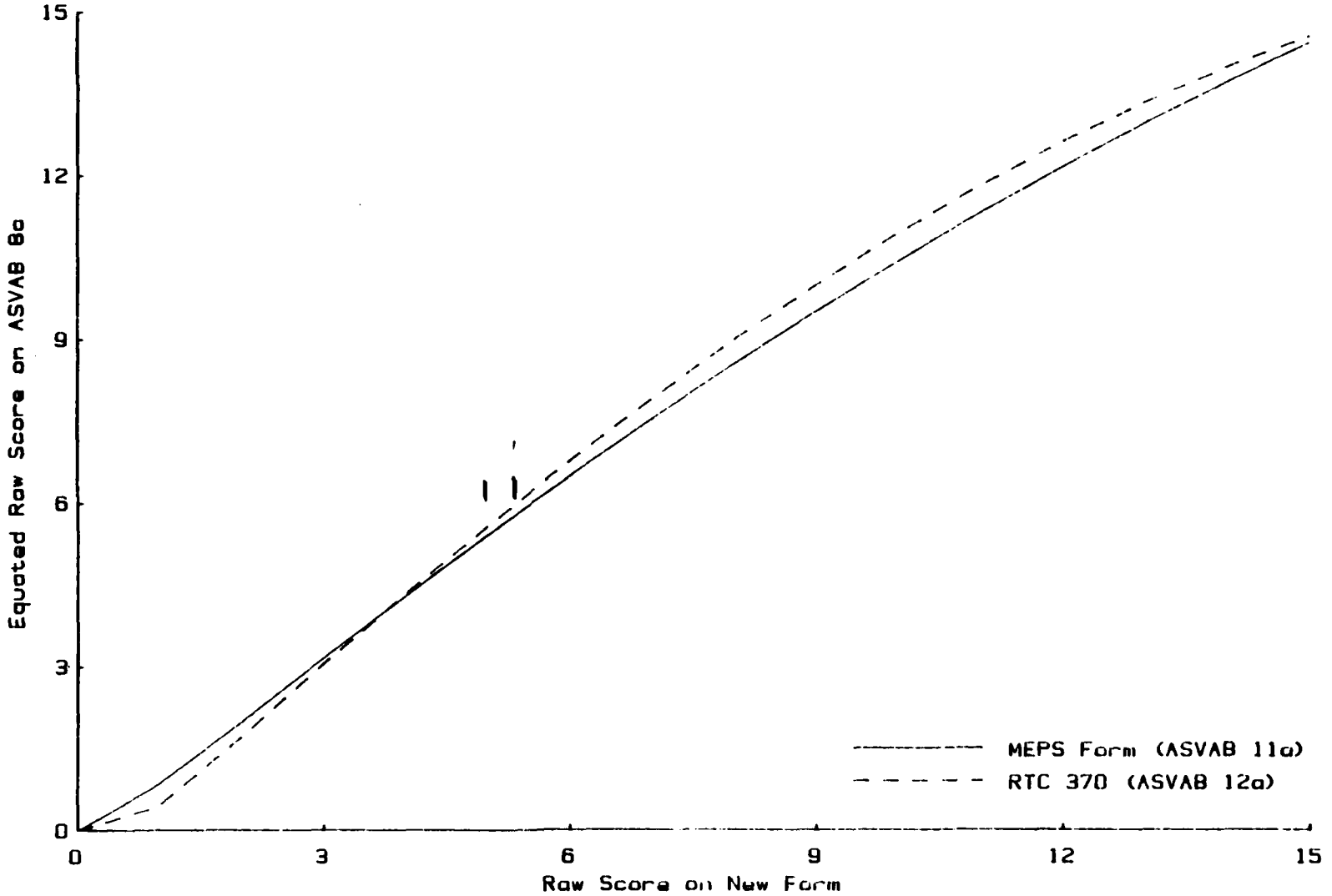

Figure B-64. Smoothed Equipercentile Equating Transformations for Raw Paragraph Comprehension Scores.

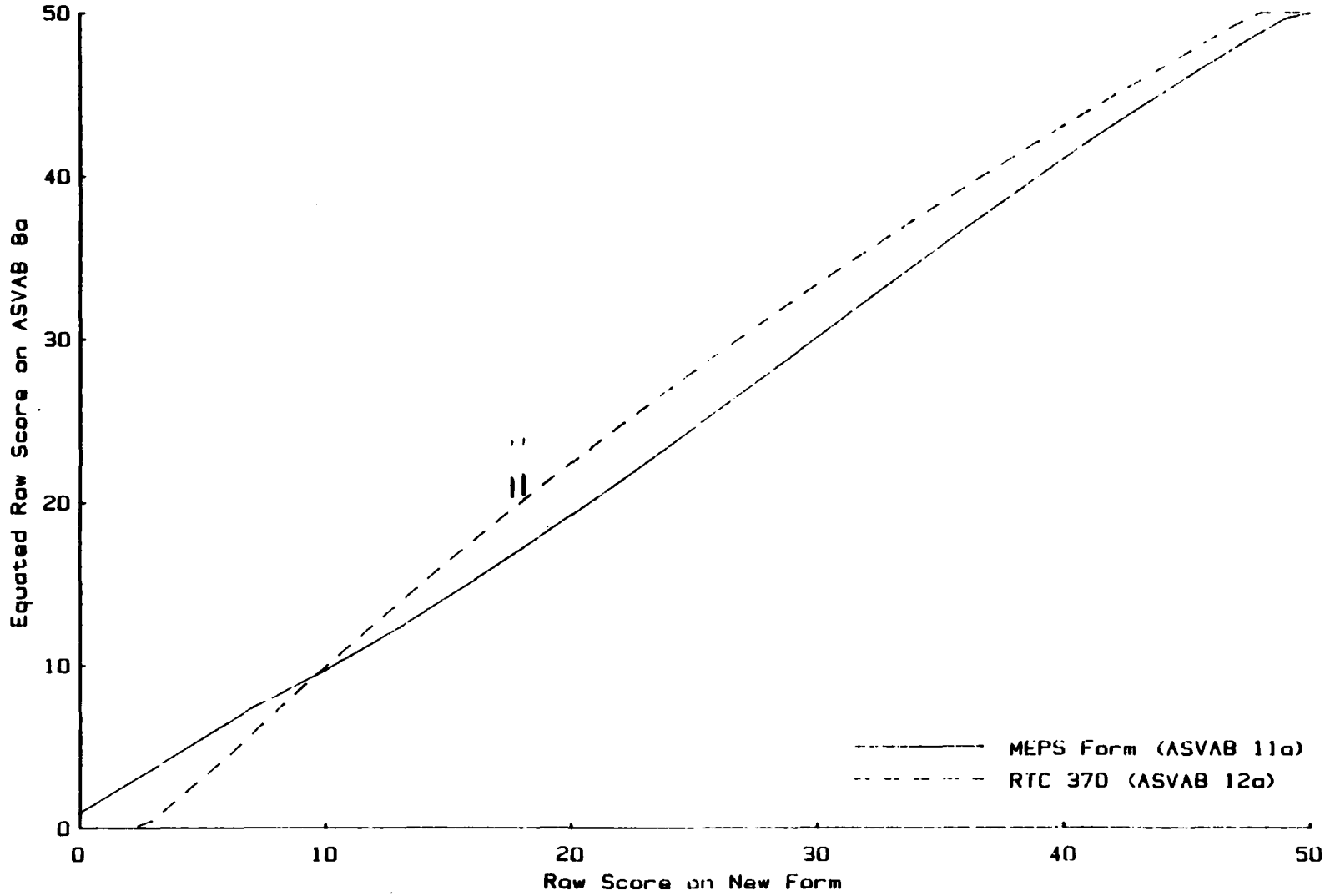

Figure B-65. Smoothed Equipercentile Equating Transformations for Raw Numerical Operations Scores.

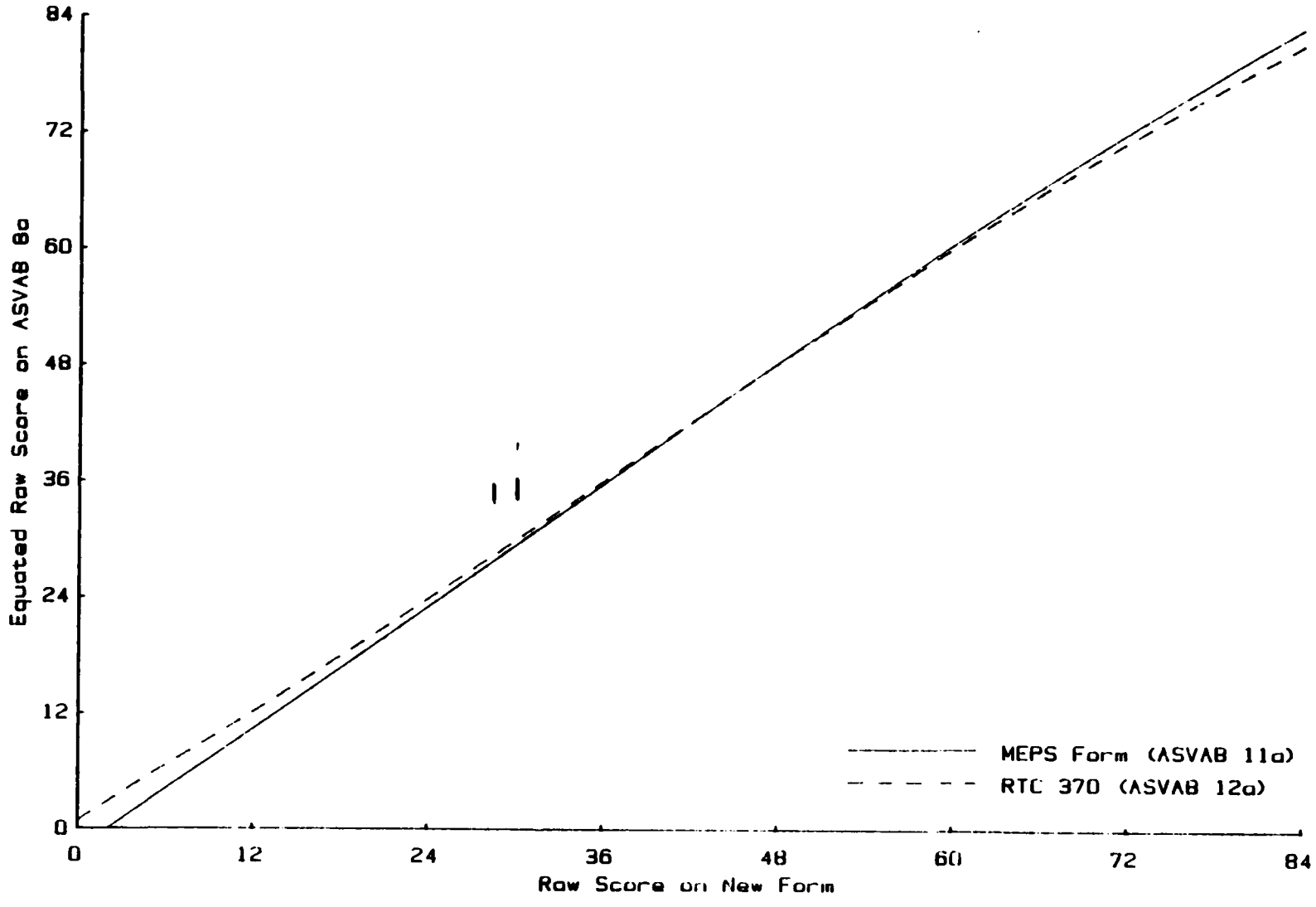

Figure B-66. Smoothed Equipercentile Equating Transformations for Raw Coding Speed Scores.

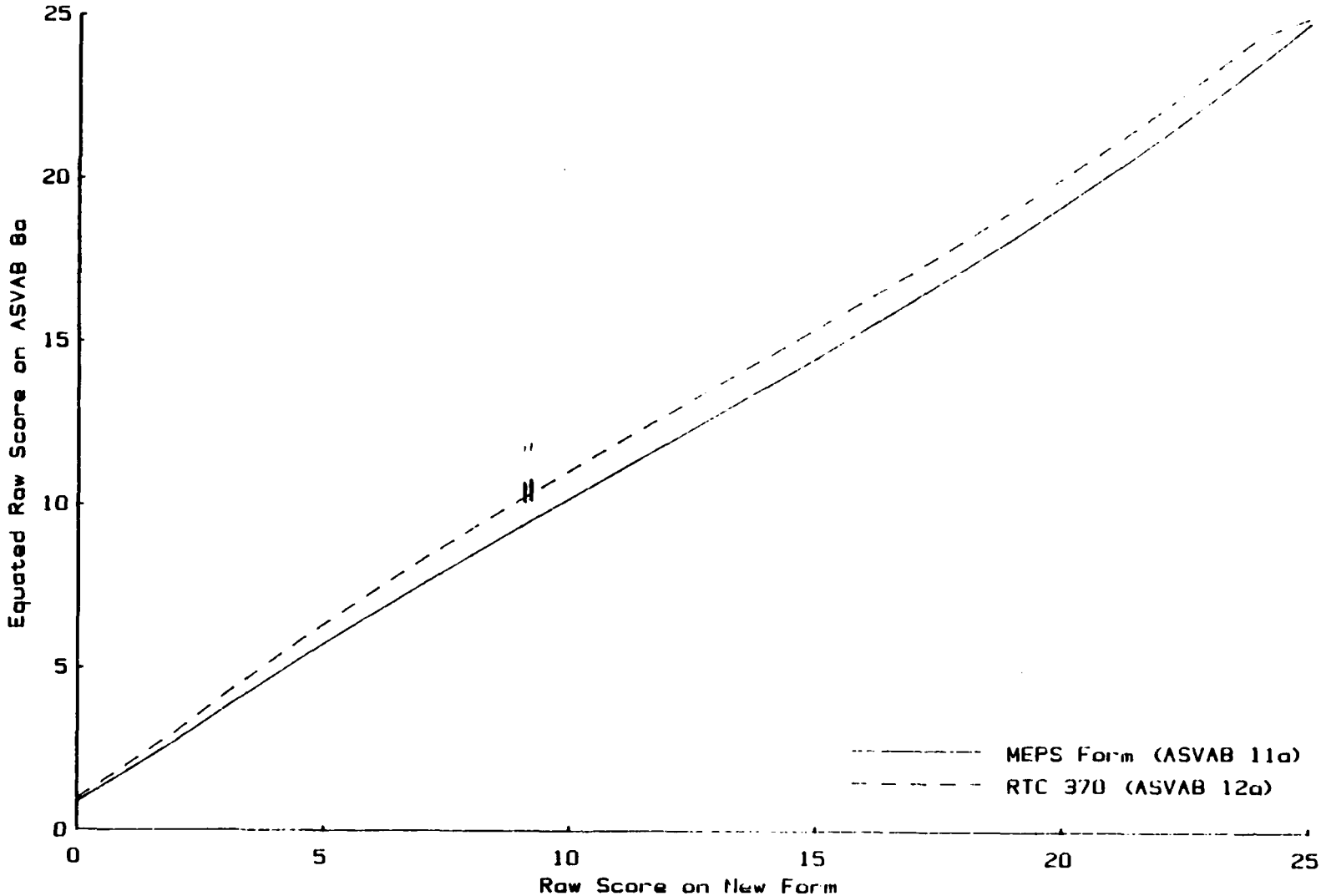

Figure B-67. Smoothed Equipercentile Equating Transformations for Raw Auto & Shop Information Scores.

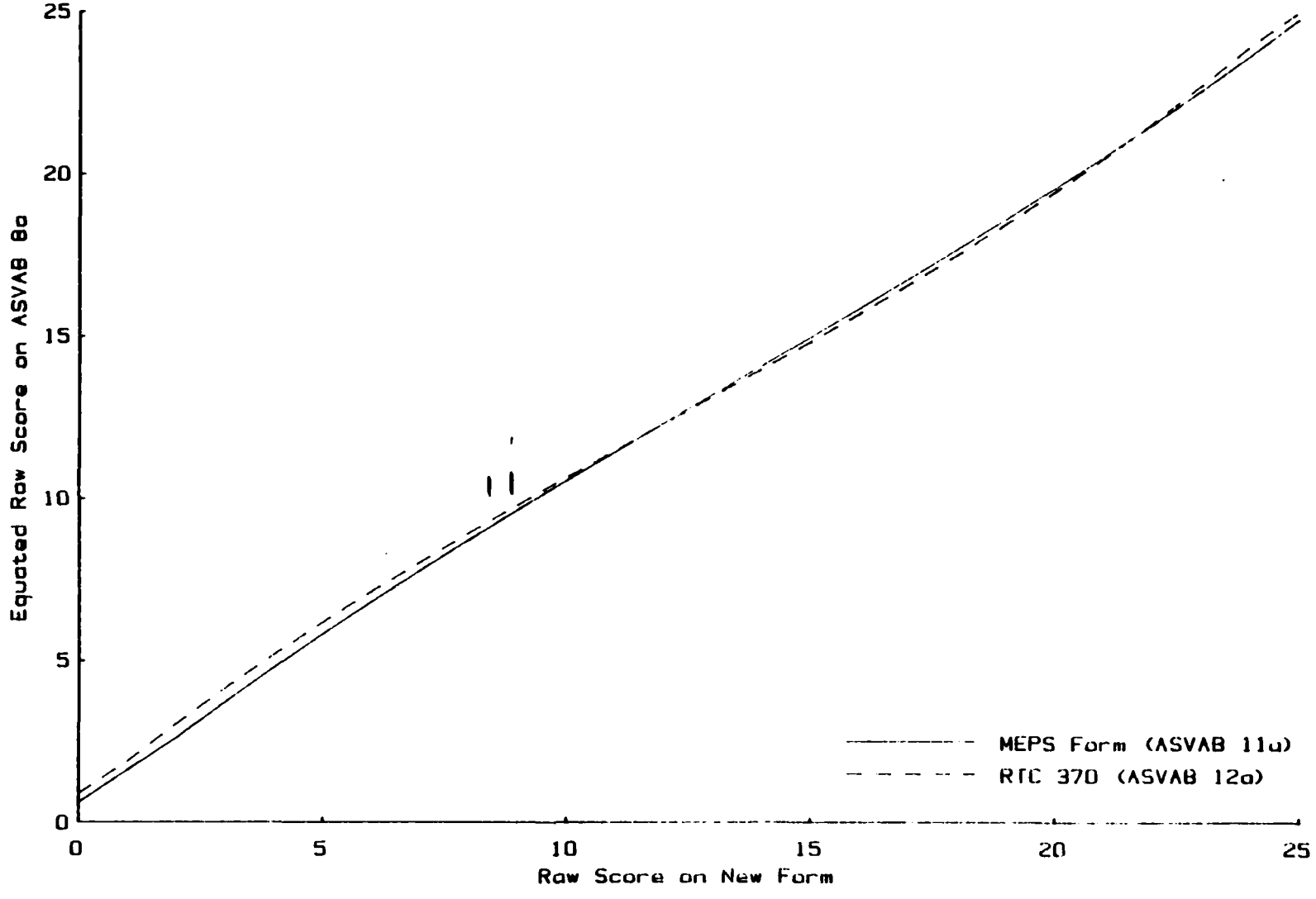

Figure B-68. Smoothed Equipercentile Equating Transformations for Raw Mathematics Knowledge Scores.

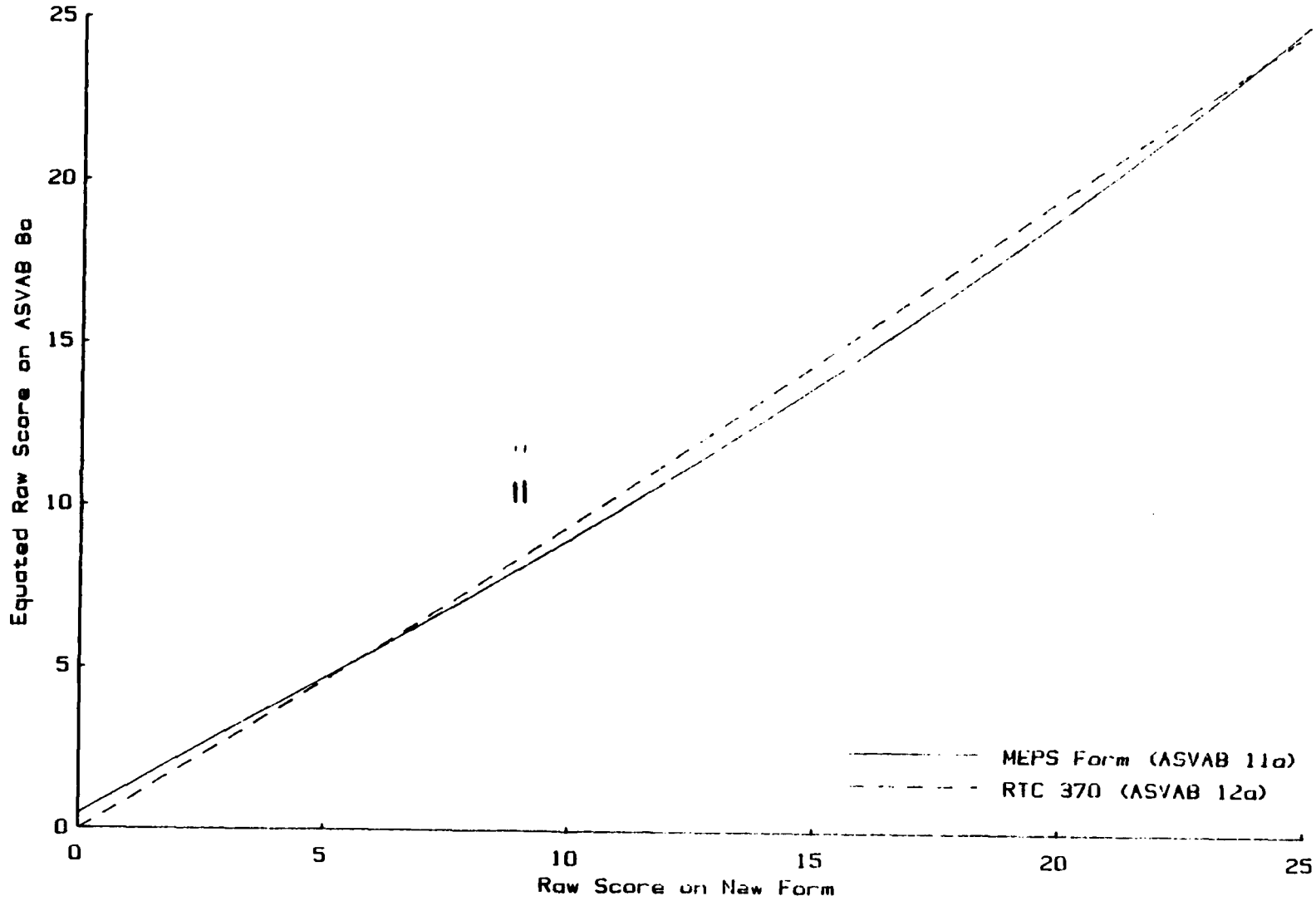

Figure B-69. Smoothed Equipercentile Equating Transformations for Raw Mechanical Comprehension Scores.

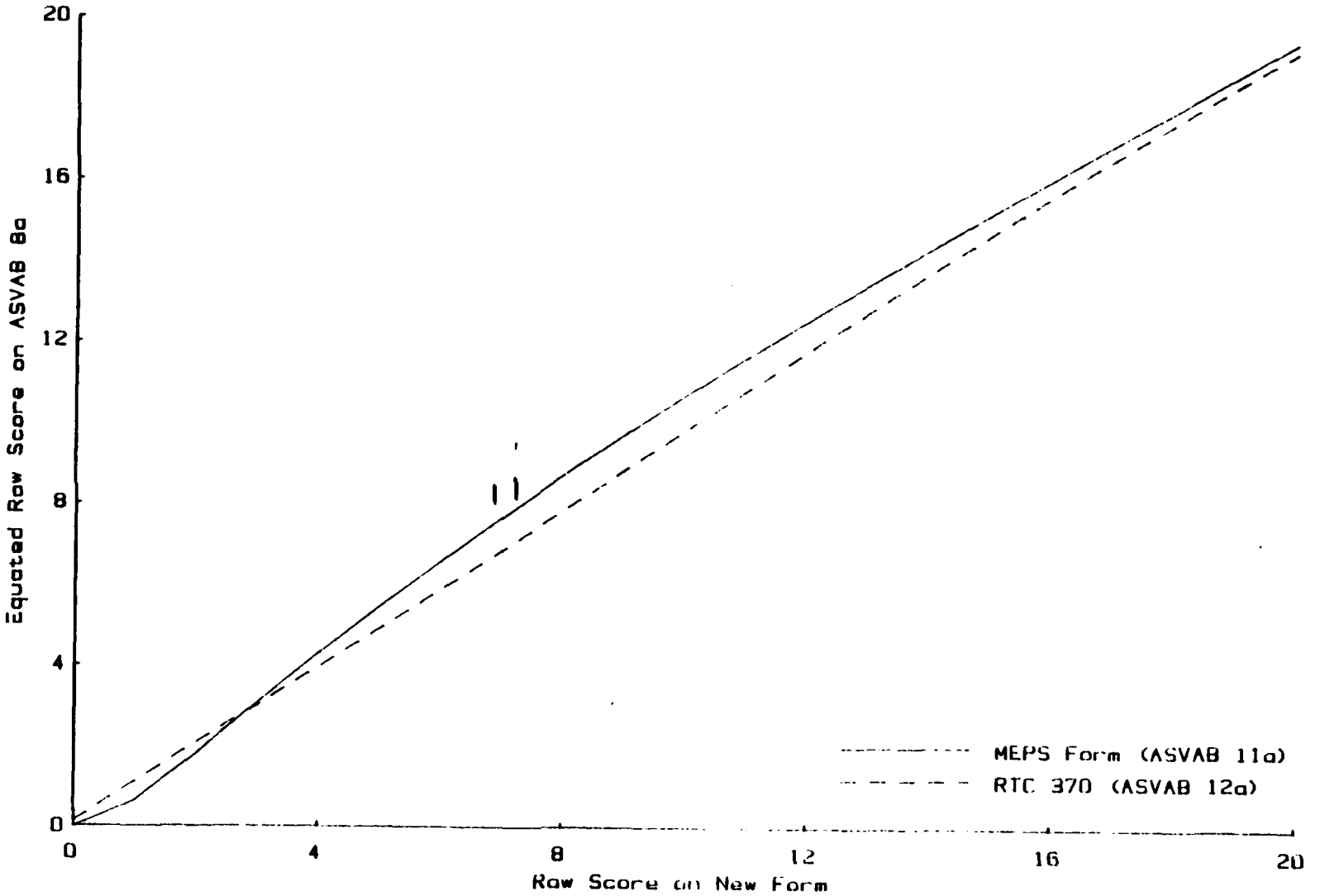

Figure B-70. Smoothed Equipercentile Equating Transformations for Raw Electronics Information Scores.

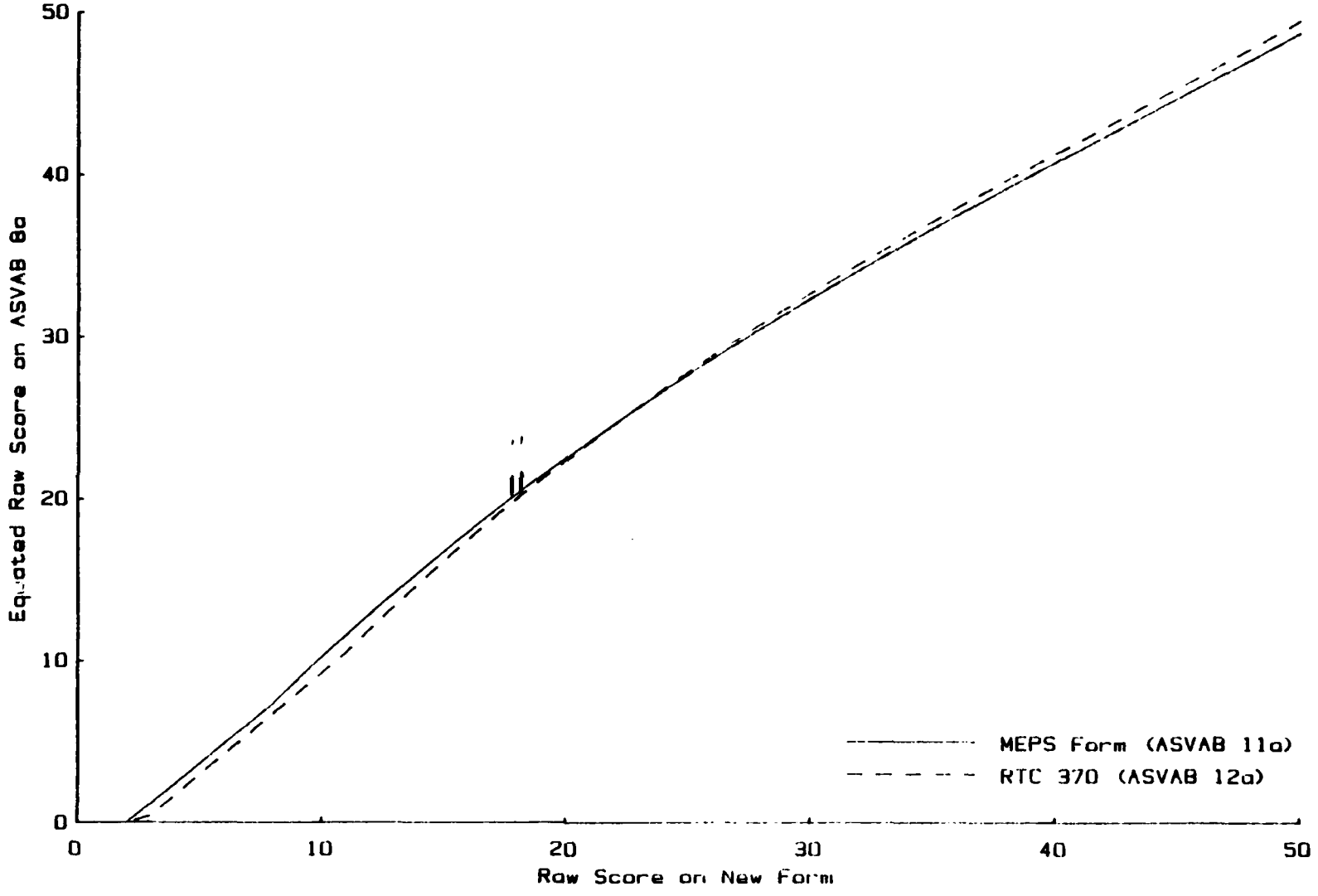

Figure B-71. Smoothed Equipercentile Equating Transformations for Raw Verbal Composite Scores.

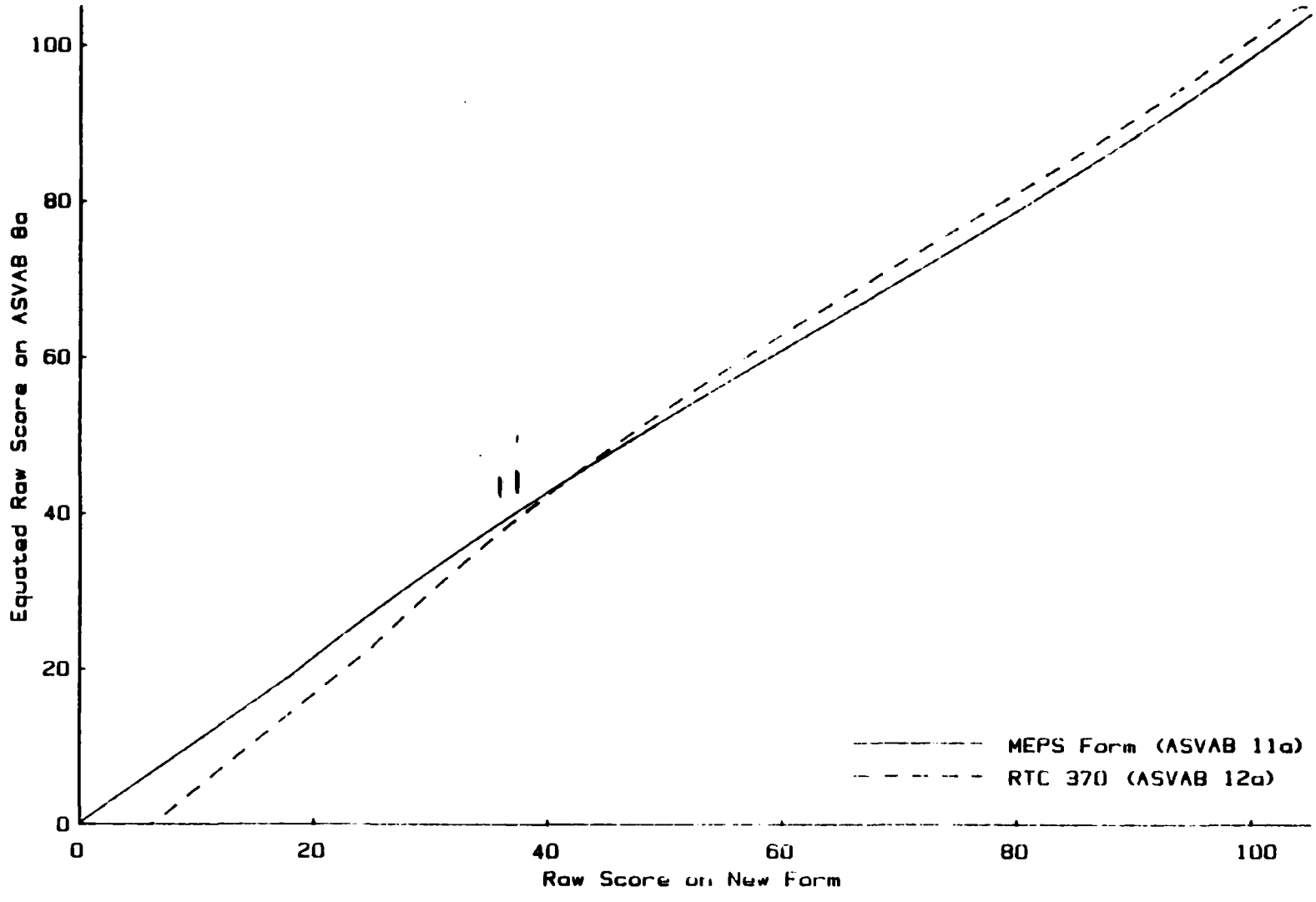

Figure B-72. Smoothed Equipercentile Equating Transformations for Raw AFQT Composite Scores.

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